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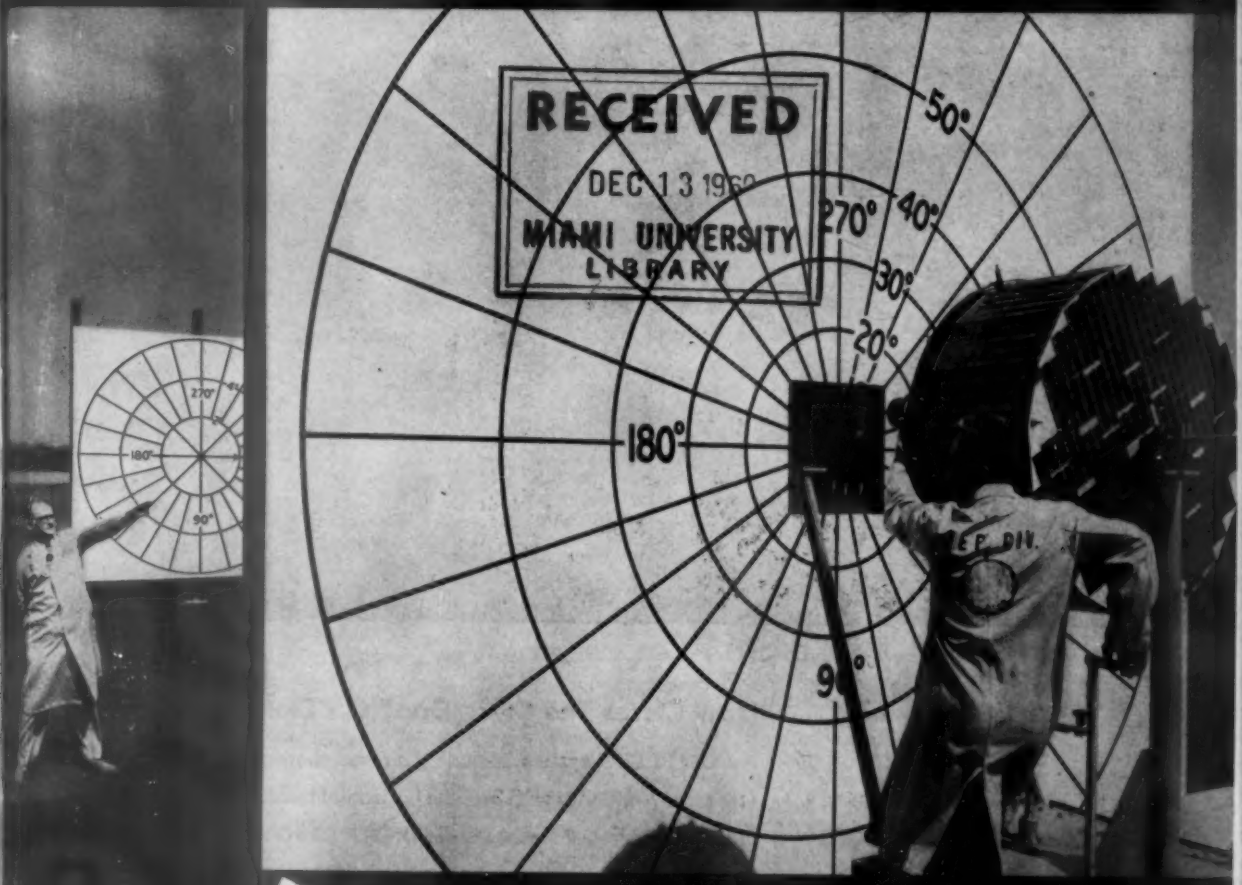

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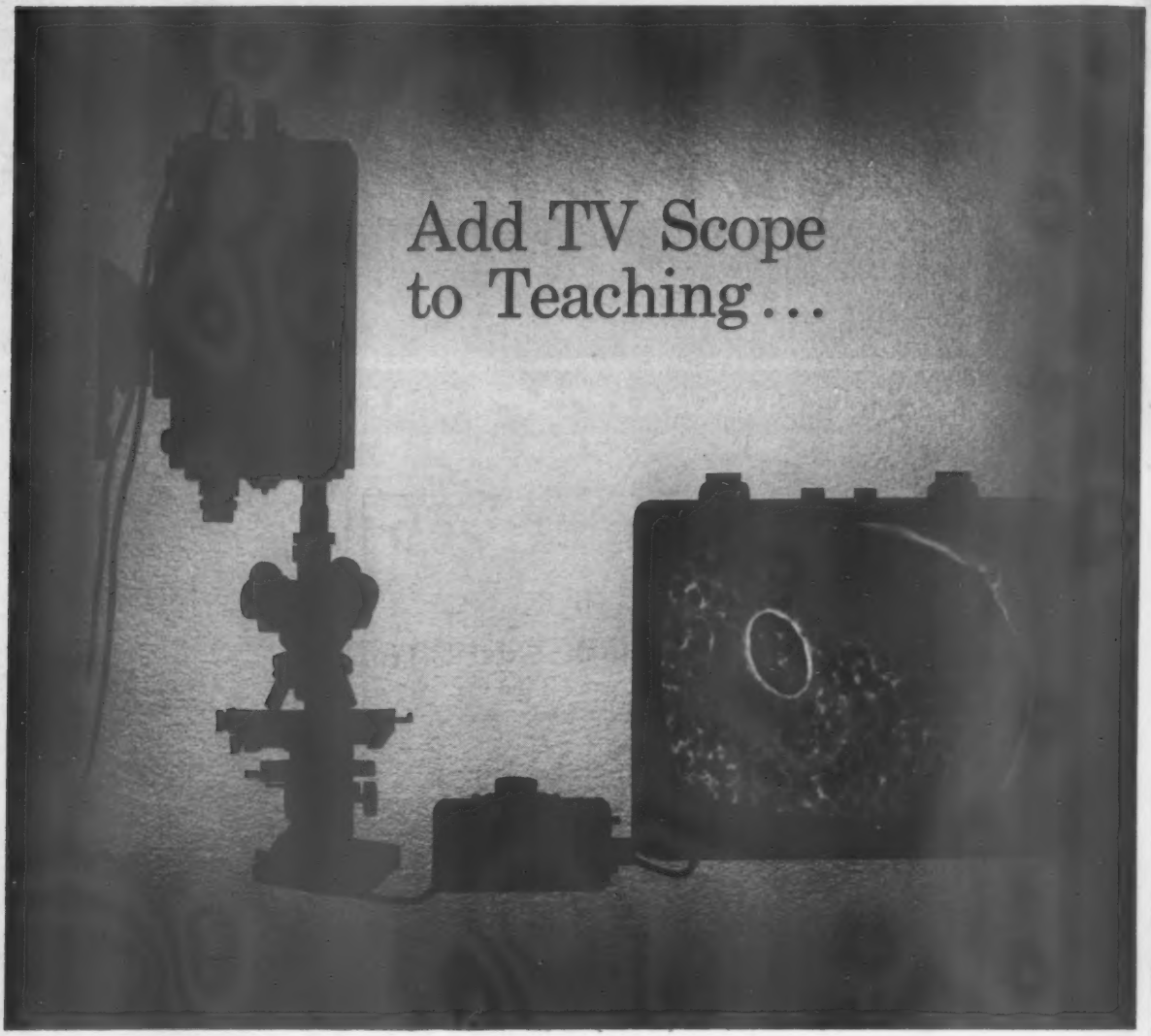

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MEDICINE

Stress in Heart Disease

After periods of emotional stress, fatty acids released in the blood by hormones may possibly change into other forms that can pile up in the blood vessels.

➤ DOCTORS ARE BEGINNING to find physiological reasons that back up statistical evidence of a link between emotional stress and coronary heart disease.

Dr. Donald S. Fredrickson, research associate at the National Heart Institute, Bethesda, Md., reported to the clinical sessions of the American Medical Association meeting in Washington, D. C., that emotional stress causes a release of adrenalin and other hormones. These hormones, in turn, release fat from its storage places in the body and put it into the bloodstream.

Excessive levels of the hormones and the fats they release drop very quickly once the stress period is over. Although no direct relation between these transient free fatty acids and coronary disease has been shown, it may be that the fatty acids are changed to other forms that can pile up in a blood vessel.

There is evidence that the time necessary to clear the blood of these fatty acids after a stress period is longer in coronary patients, Dr. Fredrickson said.

Starvation causes a similar release of fat from stored tissue. However, this does not mean that an obese person should avoid dieting for fear of heart attack.

Speaking about blood fats and coronary disease in general, Dr. Fredrickson said, "The amount of cholesterol in the diet is of no importance because you cannot eat enough cholesterol."

Triglycerides are the principal form of fat we eat, he said. An average person may eat 100 grams of triglycerides a day but, by comparison, only half a gram of cholesterol.

The pertinent point is how much cholesterol or fatty acids are synthesized in the body, and how much goes into blocking or hardening arteries.

• Science News Letter, 78:371 December 10, 1960

Child-Bearing at 35

➤ THE PREGNANT WOMAN of 35 is considered elderly for child-bearing by the obstetrician.

However, there are excellent reports of pregnant women having first babies at this age, Dr. D. Frank Kaltreider of the University of Maryland School of Medicine, Baltimore, reported at the clinical meeting of the American Medical Association in Washington, D. C.

High blood pressure, or hypertension, is the most prominent problem of the older mother. More than 20% among 237 older mothers studied at the University Hospital in Baltimore had some degree of high blood pressure.

The incidence of diabetes was three times that of younger women who had borne children. Caesarean section is twice the rate of that for younger women. The delivery of a diabetic is recommended three weeks or earlier before full term.

The elderly patient is more likely to have twins and to have large babies. She is more likely to have cancer or heart disease, and she runs a greater risk of death than a younger woman.

The infant born to an older woman undergoes greater risk of death or handicap. Dr. Kaltreider said the older woman often receives only casual care if she has had previous children.

Because of dangers attending this age, she should have the best psychological and physical care.

• Science News Letter, 78:371 December 10, 1960

Blood Pressure Lowered

➤ INJECTIONS of a placebo, or substance containing no medicinal properties, can lower blood pressure for nearly three years, University of Mississippi physicians reported. But the placebo in oral tablet form did not cause a decrease.

Drs. Raymond F. Grenfell, Arthur H. Briggs and William C. Holland presented these findings at an exhibit in connection with the American Medical Association's Clinical Meeting in Washington, D. C.

Their study, begun in 1956, involved 134 patients. Among 70 given injections, roughly half received a drug (hydrogenated ergot alkaloids) to reduce blood pressure, while the other half were given a placebo. Results were comparable.

In the case of 60 patients who received tablets of the placebo and drug, those who took the drug showed a significant decrease in blood pressure but those who swallowed the placebo tablet showed no decrease.

The physicians plan to continue the study to see how long blood pressure can be lowered by placebo, and at the same time to observe whether a simple mathematical decrease is of itself valuable in improving the basic process of high blood pressure and whether the decrease halts the progression of damage to the heart and kidneys.

Among the other exhibits were two heart-lung machines, an "open cast" method of rehabilitating the surgically corrected clubfoot and a new adhesive tape that has proved successful in closing wounds and incisions usually requiring stitches.

• Science News Letter, 78:371 December 10, 1960

SURGERY

USSR Okays Apparatus For Abnormal Births

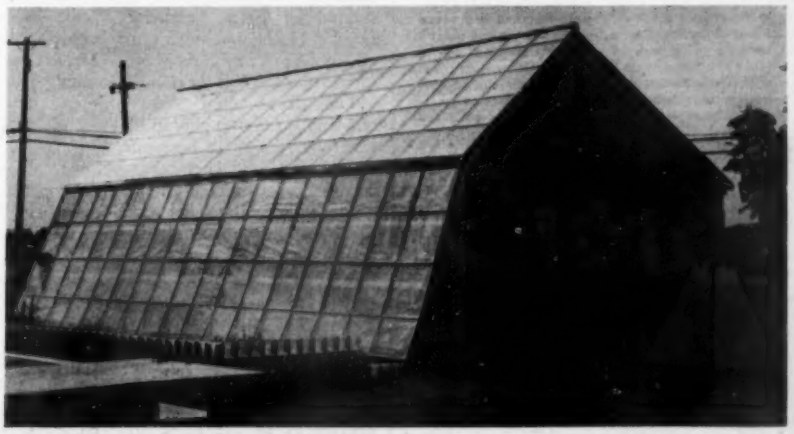
➤ A VACUUM-EXTRACTOR to replace forceps in abnormal childbirth has been approved for production in Russia.

Drs. G. G. Kotlyarevskaya and V. N. Aristova said the force exerted on the child's head by the vacuum-extractor during delivery does not cause any severe complications.

Cups of seven sizes make the instrument usable under varying conditions, they report in Abstracts of Soviet Medicine. The model is portable and can be used under any conditions, without electricity or centralized water supply.

In describing the apparatus, the scientists said various models of suction apparatus have been suggested many times for the extraction of the fetal head instead of obstetric forceps, one of the serious causes of brain injury.

• Science News Letter, 78:371 December 10, 1960



SOLAR-HEATED HOME—Last winter, Harry E. Thomasons, a U. S. Army Signal Corps employee, spent $4.65 in conventional fuel bills to supplement the heat supplied by capturing the sun's rays in the solar heat collector on the back of his house. This system also provides for air conditioning in the summertime.

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MEDICINE

Sudden Deafness Routed

➤ IF YOU SUDDENLY go deaf, make a beeline for the ear doctor's office. The faster you get there, the better your chances for having your hearing restored. Delaying more than six weeks may mean losing your hearing in the affected ear.

Dr. Woodrow D. Schlosser, consultant to the Pennsylvania Academy of Ophthalmology and Otolaryngology in Philadelphia, has found hearing can be restored to 50% of sudden deafness cases by the use of drugs if the patient seeks help the first six weeks.

The treatment is simple. In most instances, treatment is based upon the assumption that a blood vessel leading to the inner ear has become spastic. Histamine, which dilates capillaries, is given intravenously for three days and then by oral dosage for six to 12 weeks, depending upon progress. Another vaso-dilator, nicotinic acid, has also been used.

Because the vascular spasms are believed related to lack of function of the autonomic nervous system, drugs of the belladonna family, which includes antispasmodics and painkillers, have been used. More recently, heparin has come into the picture.

Most cases of sudden deafness (75%) occur in persons over 40 years old, more commonly in women than in men. Ringing in the ears precedes sudden deafness in 85% of the cases, while dizziness occurs in one-third of the patients.

Dr. Schlosser said that the cause of this malady is not fully known, but several agents are suspected. These include hemorrhages to the inner ear, thrombosis and such viral infections as sub-clinical mumps. Also included are fatigue, emotional upsets, allergies, endocrine imbalance and generalized stress.

Tests showed that the hearing loss is due to sensori-neural impairment rather than to a middle ear lesion.

• Science News Letter, 78:372 December 10, 1960

MEDICINE

Drug Therapy Can Damage Bone Marrow

➤ DRUGS USED to treat cancer can damage bone marrow. However, five cancer patients whose bone marrow was damaged by treatment with chemicals deadly to cells have recovered spontaneously, Ian Campbell Cree of Wanstead Hospital, London, reports in the British Medical Journal, Nov. 19, 1960. The five cases studied by Grant Batchelor of the West London Hospital showed remarkable powers of bone-marrow recovery, Mr. Cree, formerly of West London Hospital, said.

The drugs used were thiotepa (triethylene thiophosphoramide) and testosterone, the male hormone.

Surgery and chemotherapy, or drug treatment, for some 50 cases of breast cancer given by Mr. Batchelor and other British surgeons and reported during the past year have shown favorable results.

Mr. Cree said that although the final verdict of this form of treatment must await a five-year or even a ten-year follow-up, the disappearance of skin metastases, or spread, the complete clearing of chest effusions, and the relief of pain in affected bones, combined with a remarkable improvement in the sense of well-being in advanced cases, has been most encouraging.

The only important side effect encountered was toxic damage to the bone marrow among five of 17 cases treated. Caution in dosage was advised.

• Science News Letter, 78:372 December 10, 1960

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MECHANICAL HAND DRAWS WEATHER MAP IN THREE MINUTES

METEOROLOGY

Tiros II Weather Reporting

See Front Cover

➤ TIROS II, the latest United States satellite, is traveling in the "best circles" of any space vehicle launched to date, while it takes the temperature of the earth's atmosphere and cloud cover with special infrared sensors.

The circular orbit, "the best ever obtained from any satellite," varies by less than 25 miles, Dr. Morris Tepper, chief of the meteorological satellites program of the National Aeronautics and Space Administration in Washington, D. C., reported.

Special orientation equipment also makes it possible for TIROS II to keep a position relative to the earth that provides highest efficiency in taking and relaying data and pictures.

The meteorological satellite whirls through space at 16,767 miles per hour, circling the earth every 98.2 minutes.

The innovation of infrared equipment, not in TIROS I, promises to provide "the most fundamental data necessary to understanding what makes weather," Dr. F. W. Reichelderfer, chief of the U. S. Weather Bureau, reported.

"The atmosphere is the earth's heat engine. The sun pours its heat on the earth and this heat is reflected back into the atmosphere. It is this circulation and exchange that makes for variation in weather," Dr. Reichelderfer said.

Ten years of observation and temperature recordings may be needed, he said, before it will be fully understood by scientists how the heat engine works.

But the data that will come from the infrared equipment in TIROS II marks an important step forward in achieving the understanding necessary for accurate long-range weather prediction and ultimately weather control.

The pictures and data are being transmitted to Suitland, Md., for experimental use in the Weather Bureau's computer for numerical weather prediction.

"The satellite information will fill in the gaps that now handicap the operation of the computer," the U. S. weather chief said. "This will help us fit together the tremendous jigsaw puzzle we call weather."

Calibration of the focus and field of view of the Tiros II television cameras was made with the aid of large "targets" at RCA's Astro-Electronic Division, Princeton, N. J., where the Tiros TV system was developed.

Tiros rotates on its mount for calibration of its wide-angle TV camera in the picture seen on the cover of this week's SCIENCE NEWS LETTER.

To provide information from the weather satellite to the world as rapidly as possible, 14 nations have joined with the United States in supplemental weather observations. These then will be compared by each country with TIROS cloud cover photos, to be forwarded by the U. S. to each participant.

Invitations to participate were sent by the Weather Bureau and NASA jointly to countries with national space committees or membership in the internation Committee on Space Research called COSPAR.

Participating countries are Australia, Belgium, Denmark, England, West Germany, France, India, Japan, Mexico, the Netherlands, South Africa, Switzerland, Norway and Sweden. Those who have not yet responded include the Soviet Union, Czechoslovakia, Italy, Poland, Canada and Spain. The world weather data center ultimately will be able to supply the scientific data from TIROS, "including the cloud cover photos," Dr. Reichelderfer said.

• Science News Letter, 78:373 December 10, 1960

METEOROLOGY

Weather Maps Are Now Drawn Electronically

➤ MORE ACCURATE weather forecasting in less time is now possible through the use of an electronic device that draws weather maps from data supplied it on tape.

A complete weather map of the Northern Hemisphere can now be drawn in less than three minutes, compared to 20 minutes by the hand-drawn method.

Weather information on magnetic tape is fed into the electronic device. The mechanical hand of the plotter then automatically draws contours or isobars, representing lines of equal barometric pressure, on a map of the Northern Hemisphere.

Reproductions of this map are sent immediately to the major Weather Bureau stations thoughout the country for use in local and regional weather forecasting.

The weather information fed into the computer is gathered from more than 500 weather observation stations throughout the Northern Hemisphere.

Dr. George P. Cressman, director of the National Meteorological Center, Suitland, Md., where the new device was demonstrated, believes that this automation "is another link in the fundamental technological changes now occurring in the science of meteorology."

The computer-plotter was developed for the U. S. Weather Bureau by Electronic Associates, Inc., Long Branch, N. J.

• Science News Letter, 78:373 December 10, 1960

METEOROLOGY

China Weather Control Experiments Analyzed

➤ CHINESE COMMUNIST experiments with weather control, primarily using cloud-seeding, have not yet entailed any basic research, the U. S. Department of Commerce reported.

Surveys of available Chinese Communist information, analyzed in "Chinese Communist Weather Control Experiments," indicate that the Chinese have chosen to bypass the research phase and use techniques the West and the Soviet Union have used with some success.

The report discounts Chinese claims of 70% to 80% success in cloud-seeding and estimates it at the 10% to 15% of United States experiments. However, the report said, even a small increase in precipitation would be economically significant if it occurred at crucial times.

The Chinese Communists have been actively engaged in weather control experiments since a 1958 drought. Research will probably be included in future programs.

• Science News Letter, 78:373 December 10, 1960

PUBLIC HEALTH

Trampoline Dangerous

➤ DEATH AND INJURY have resulted from acrobatics on the trampoline, the popular canvas mat on springs.

Five cases of severe injuries to the nervous system resulting from trampoline accidents are reported in the Journal of the American Medical Association, 174:1673, 1960. One of the injured, a 19-year-old member of a university gymnastics team, died.

An editorial accompanying the article says, "In view of the popularity of the trampoline, physicians and health agencies throughout the nation should be alerted to the present problem."

With proper supervision trampolining can remain safe and can provide "an enjoyable means of exercise for a flabby nation," the editorial concludes.

Drs. William G. Ellis, David Green and A. L. Sahs of the University Hospitals, Iowa City, Iowa, and Norman R. Holzaepfel, assistant professor and gymnastics coach, State University of Iowa, report on the five cases.

"When the maneuvers are performed imperfectly or incompletely, they lead only to disaster."

The number of accidents is much larger than the five described, but up to now, the investigators believe, no documented reports have appeared in major medical journals.

All five were men, from 17 to 38 years old.

To prevent further serious accidents, the investigators urged local departments of health to establish minimum regulations governing trampoline amusement centers. Regulations should cover the following points:

1. The presence of qualified instructors at all times.
2. The type of equipment and its continued repair.
3. Minimum number of persons on trampoline at the same time.
4. Minimum distances between trampolines and between them and other obstructions.
5. Prohibition of eating on trampolines.
6. Proper lighting.
7. Enforced rest periods.
8. Compulsory wearing of shirts and socks while jumping.
9. Registration of patrons, including previous gymnastic experieince and whom to contact in case of accident.
10. A training program for the patrons before they attempt such maneuvers as somersaults, particularly for children who may not appreciate the risks involved.

• Science News Letter, 78:374 December 10, 1960

MEDICINE

Floating Cancer Cells

➤ PATIENTS WHO HAVE had malignant tumors removed may have floating cancer cells that may not give trouble for years following the operation. Only a small percentage of the cells live but they can cause death, scientists discovered after research on mice.

The scientists injected radioactive thymidine into mice after first injecting a certain number of cancer cells into the mice's veins. Thymidine is a natural compound that rapidly growing cells readily take up and incorporate in their genes.

A day or two later, the scientists killed some of the mice and with radiation-detection techniques searched each organ for radioactive cancer cells.

Only eight of every 1,000 injected cancer cells survived. But cells that lodged in the mouse lungs or other organs, within two hours took up the thymidine and other materials needed for cell division and began multiplying to form new cancer colonies.

The researchers said that after the first two days, 100% of the surviving cells divided at a constant rate every 20 hours, and that any slowing of cell division beyond the 20-hour rate by drugs would register anti-cancer effect.

The results of the research help to explain why patients can go for years after cancer operation without recurrence of malignancy. The findings indicate that cancer cells do not sleep. They divide constantly, and it is only when the colonies become big enough to be seen or felt, to cause pain or trouble, that they are noticed.

Human cancers, starting from a single cell, could grow for many years without detection, the scientists said.

The research, reported by the American Cancer Society, was done by Drs. Renato Baserga, Walter E. Kisieleski and Karen Halvorsen of Northwestern University Medical School and the Argonne National Laboratory. The Illinois Division of ACS helped support the studies.

• Science News Letter, 78:374 December 10, 1960

VIROLOGY

Viruses Injure Host Cells With Excess Viral "Skin"

➤ VIRUSES GROW inside the cells they infect and injure their host cells by producing excess amounts of viral "skin" and viral "insides" in two separate processes.

Dr. Harold S. Ginsberg, microbiologist at University of Pennsylvania School of Medicine, told the National Academy of Sciences meeting, Philadelphia, that cells grown in tissue culture and infected with adenovirus shows striking changes in their nuclei.

The nuclei increase in size and show large dark-staining masses and crystals composed of millions of virus particles. The damaged cells also become round and clump in grape-like clusters, Dr. Ginsberg said.

The virus particles contained deoxyribonucleic acid, or DNA, which usually serves as the "core" in the mature virus, and protein, usually wrapped around the DNA like an overcoat, or skin.

The larger intranuclear masses were mostly viral DNA, which differed from normal cell DNA in chemical properties and chemical structure and was produced in surplus amounts. Viral protein was also produced in excess proportions.

The conclusions drawn from the studies are that the nucleic acid of adenoviruses is derived from a new and unique DNA; that the parts or subunits, DNA and proteins, of the infectious virus are synthesized independently; that these components of the virus are produced in great excess; and that the accumulation of these surplus virus precursors lead to injury of infected cells.

• Science News Letter, 78:374 December 10, 1960

MEDICINE

X-Ray Risks to Mothers Challenged by Study

➤ A 12-YEAR STUDY of the case records of pregnant women who had abdominal X-ray examinations before their children were born has challenged the belief that X-ray exposure during pregnancy may cause a greater risk of leukemia to the child.

The study by Dr. W. M. Court Brown and Dr. Richard Doll covered maternity cases in four London hospitals and four in Edinburgh, Scotland. The total number of children involved was 39,166.

The doctors reported to the Royal Society of Medicine that up to 1958, only nine of these children had died of leukemia. Compared with the British national rate for mortality from leukemia, this rate is 1.5 below average.

The rate shows that the abdominal X-ray examinations did not produce an excess of leukemia deaths, Drs. Court Brown and Doll believe. They said their investigation contradicts the figures presented two years ago by Dr. Alice M. Stewart, head of the department of public health and social medicine at Oxford University.

Dr. Stewart and her colleagues in their pregnancy survey had then said that they found that X-rays to a pregnant woman's abdomen were likely to double the risk of the child dying from an excessive number of leucocytes in the blood or from cancer before the age of ten.

Drs. Court Brown and Doll believe their investigation was as objective as possible and that the 12-year period covered by it provided adequate time for leukemia to have developed, if it was going to at all, although there may be possible sources of inaccuracy in their work.

However, in accordance with the best radiological practice, they urged continued avoidance of unnecessary X-ray examinations during pregnancies.

• Science News Letter, 78:374 December 10, 1960

VITAL STATISTICS

Family Growth Controlled

➤ THE PROPORTION of married couples in the United States who try to regulate the number and spacing of their children increased markedly over the last five years, the Scripps Foundation for Research in Population Problems, Miami University, Oxford, Ohio, has found.

In 1955 seven out of ten white couples with the wife 18 to 39 years old had used some method to regulate family growth. Now the proportion is eight out of ten.

Periodic continence, commonly called rhythm and acceptable to the Catholic Church, is one of the popular methods of contraception. A majority of couples use other methods, however.

These are the first findings from the 1960 study of family growth patterns being conducted by the Scripps Foundation and the Survey Research Center of the University of Michigan. Interviews were completed with more than 3,300 wives in the childbearing ages. More than 2,700 wives were interviewed in 1955.

Both groups are representative samples of wives of childbearing age in the United States.

The investigators found that the more widespread use of contraception by married couples in 1960 than in 1955 is due chiefly to the lower age at marriage since World War II. In the late 1940's and early 1950's, the number of marriages was unusually large because so many couples were marrying at younger ages than formerly.

Once married, they proceeded to have the children they wanted with no more delay than formerly. The result was the concentration of childbearing at younger ages and its curtailment at older ages, in spite of some increase in average family size.

The new pattern of younger marriage was well established by 1955, hence the number of marriages between 1955 and 1960 was not unusually large. Couples in which the wife was under 40 in 1960 had been married longer than had those with wife under 40 in 1955. More of them had all the children they wanted and were trying to keep from having additional children.

The larger proportion of couples who have all the children they want and the increase in the proportion using contraception help to explain the lower birth rates of the last year shown by the National Office of Vital Statistics.

• Science News Letter, 78:375 December 10, 1960

AGRICULTURE

Plant Disease Compounds

➤ AN ANTIBIOTIC and an antifungal agent have been found effective in fighting plant diseases.

Experiments with tetrin, the antifungal agent, showed it capable of preventing growth of all the fungi tested, animal as well as plant pathogens, but inactive against bacteria.

When applied by spray, tetrin was nontoxic to tomato, beet, pea, radish, broccoli, and soybean plants. Even at high concentrations it did no harm to some crops and usually did not affect germination.

The new antibiotic, a compound called P-9, was described as "highly potent, persisting, fast-acting and translocatable." It is expected to be effective in controlling cereal rusts.

Both the antifungal agent and the antibiotic were synthesized by the mold Streptomyces, scientists report in separate articles in Phytopathology, Nov., 1960, journal of the American Phytopathological Society. Tetrin was decribed by Dr. David Gottlieb and Hugh L. Pote of the University of Illinois. A Merck Sharp & Dohme Research Laboratories team, Rahway, N. J., reported on the new antibiotic.

In a third report, three U. S. Department of Agriculture scientists, Robert P. Kahn, T. C. Allen Jr., and W. J. Zaumeyer, described a plant-virus inhibitor isolated from rice that, like P-9, seems to act on the plant-host rather than on the disease organism itself.

In experiments with 15 viruses the inhibitor proved to be effective with all but three. The experiment suggested that rice extracts may prevent tobacco mosaic virus infection of beans if applied before infection, or retard virus multiplication if applied shortly after.

In past experiments using "wonder drugs" to combat plant disease, the compounds not only destroyed the viruses and fungi but killed or harmed the plants. These new compounds may become effective tools for safely treating diseased plants.

• Science News Letter, 78:375 December 10, 1960

EDUCATION

Lecture Slides Show Wind Really Blowing

➤ STUDENTS REALLY "see" the wind blowing now in classes at the Massachusetts Institute of Technology in Cambridge.

Prof. Erik Mollo-Christensen is using new lecture slides, each one containing a miniature but actual working tunnel. The slides, about one inch thick, fit into a special projector.

What hapens in the wind tunnels can be seen greatly enlarged on a screen when the slides are projected. A vacuum cleaner attached to one side of the projector provides the wind. Red fluids inside the slides show effect of wind on nozzles, airfoils and other geometrical arrangements with which aeronautical engineers must deal.

M.I.T. is changing its approach to laboratory instruction to emphasize individual projects, Prof. Mollo-Christensen reported in Technology Review, Dec. 1960.

"Lecture demonstration apparatus," he said, "should show something interesting and pertinent in a way that students will remember it. It also should be portable, and have infinite shelf life. It should not be useful for anything else, such as research, however, since it then would be borrowed and modified to an extent which would make it useless."

His new miniature wind tunnels meet these requirements. With the help of students, 20 different slides containing various types of tunnels have been designed and constructed in his laboratory. They are one of several new aids to teaching now being introduced in the M.I.T. School of Engineering.

• Science News Letter, 78:375 December 10, 1960

GEOLOGY

Quake in Yellowstone Exposes Buffalo Tracks

➤ WHEN THE EARTH SHOOK in Yellowstone Park in August, 1959, due to a severe earthquake, hot pools were changed into active geysers, quiescent steam vents were rejuvenated, and other regular hot water phenomena went dormant.

A glimpse into the Park's human history was also provided, when many layers of rocks were eroded away in the biscuit basin, exposing a moccasin track of an early Indian and buffalo tracks. Both were fossilized in the geyserite rock.

The moccasin print and several buffalo footprints are within a few feet of the rim of Sapphire Pool. Several feet of rocks were carried away in this area since Sapphire Pool experienced the most violent and spectacular change of all hot water features since the quake. Formerly a quiet hot pool, it started erupting as a geyser. In some eruptions water is thrown 150 feet into the area with a spray up to 200 feet wide.

• Science News Letter, 78:375 December 10, 1960

FOSSILIZED BUFFALO TRACKS

ROCKETS AND MISSILES

No Lag in Missile Program

➤ THERE IS NO LAG in the United States missile program, the men behind the nation's missile launchings reported at Andrews Air Force Base, Md. The Russians lag behind the U. S. in the technique of miniaturization, and soon this country will be able to meet and surpass the Soviets' larger rocket booster capacity.

"There is nothing in our missile program about which the American people have to be ashamed," Maj. M. E. Griffith, chief for test operations for the Air Force Ballistic Missile Division at Cape Canaveral, Fla., said.

His statement was backed by Capt. Rob Roy, launch controller at Vandenberg AFB in California and test conductor for the Discoverer satellite series, and their top military officer, Lt. Gen. Bernard A. Schriever, Commander, Air Research and Development Command.

"We've never had a launch failure at Cape Canaveral," Maj. Griffith said. He defined "failure" in launch as not knowing precisely what happened.

"We have yet to launch a missile at Cape Canaveral that we have not known what happened to it," the man responsible for the launches of Air Force Pioneer lunar probes, the paddle-wheel satellite, the mouse-in-space projects, and more than 100 other launchings explained.

The art of missile launching in the Air Force has developed to the point that "having them operational and functioning on schedule is 'old hat,'" Capt. Rob Roy said. "In fact, a launch no longer interferes with home dinner schedules," he added. A vehicle passed for launch can be made operational in 15 minutes.

This has been accomplished through rigorous tests that satellites and missiles must pass before being "graduated" to the launch pad. Each approved vehicle must be able to remember the information placed in its electronic components, communicate through telemetry, and react as commanded.

But it takes the longest 90 minutes in the space and satellite business before the launched vehicle completes one successful orbit and lets the men on the ground know by its voice from space that all is well.

The missile experts were part of a "Footsteps into Space" program presented at a meeting of the Andrews Air Force wives, most of them wives of men in the ARDC.

• Science News Letter, 78:376 December 10, 1960

GENERAL SCIENCE

STS Competition Begins

➤ WITH THE OPENING of the 20th Science Talent Search for the Westinghouse Science Scholarships and Awards, thousands of high school seniors will leap the first hurdle toward recognition in this famous annual program to discover America's most promising young research scientists. The examinations are given by teachers during December.

In high schools across the country aspiring students will be taking the challenging Science Aptitude Examination. They will finish writing and polishing reports on their science projects and will complete information forms asking about their activities and abilities. Their teachers will supply facts about their attitudes and accomplishments, and their principals will certify their academic records.

Completed entries for the twentieth anniversary of the Science Talent Search are expected to surpass all previous records in quality, it is predicted by SCIENCE SERVICE, which conducts the Search as an activity of its youth program. More than 28,000 sets of entry materials have been distributed upon specific request by educators for their most outstanding seniors.

The science aptitude examination is designed by Dr. Harold A. Edgerton, New York consulting psychologist, to measure ability in scientific thinking and reasoning. The two-and-a-half-hour test will be administered by educators in public, private and parochial schools in the United States at any time up to Dec. 27, but all materials must reach Science Clubs of America headquarters in Washington, D. C., by midnight, Tuesday, Dec. 27.

Approximately ten percent of the students who fulfill all the entry requirements will be named members of the Honors Group and recommended to colleges and universities for admission and scholarship grants. From the Honors Group, 40 top winners will be selected to come to Washington for the Science Talent Institute, March 2 through March 6.

During the Institute the 40 winners will be interviewed and their potential ability further evaluated by a board of judges to determine the distribution of $34,250 in science scholarships and awards provided by the Westinghouse Educational Foundation.

• Science News Letter, 78:376 December 10, 1960

GENERAL SCIENCE

Winning Science Fair Exhibits Travel to India

➤ THE TOP BIOLOGICAL projects exhibited at the 11th National Science Fair-International in Indianapolis last May will be part of the All-India Science Congress at the University of Roorkee, India, Jan. 2 to 9, 1961.

The science projects of Susan Brown of Austin, Texas, and Gary Botting of Peterborough, Ontario, Canada, the First Award winners in biological sciences at the National Science Fair-International conducted by SCIENCE SERVICE, will be an important feature of the large biological science exhibit to be displayed by the American Institute of Biological Sciences at the Indian Congress.

Susan and Gary were given special honors at the international science fair by the AIBS and were special guests at the Institute's Annual Meetings of Biological Societies in Stillwater, Okla. Some 2,500 American scientists attended the meetings at which Susan exhibited her work on a root growth factor isolated from bean seedlings and Gary showed the unusual crossbreeds of Cynthia moths which he had developed.

Susan is now attending the University of Texas, and Gary is a student at Peterborough Collegiate and Vocational School.

The All-India Science Congress, the largest scientific gathering in India, is attended each year by about 5,000 eminent Indian scientists and educators and by many visitors from other nations.

• Science News Letter, 78:376 December 10, 1960

VIROLOGY

Virus Growth Studied With Electron Microscope

➤ WHAT APPEARS to be the growth processes of viruses within a cell—from naked threads of nucleic acid to "full-clothed" rod-like viruses—has been revealed by electron microscope studies.

Drs. John M. Adams and David T. Imagawa of the University of California Medical School at Los Angeles, with Dr. J. R. Goodman of the Long Beach Veterans Administration Hospital Research Laboratories, studied three related viruses —measles, distemper and rinderpest.

When these, as well as other viruses, attack a living cell, new objects called inclusion bodies appear in the cell nucleus and cytoplasm.

The UCLA investigators examined these inclusion bodies, which have a characteristic pattern in cells invaded by each of the viruses, under the powerful electron microscope.

In certain stages of development, the pattern is one of randomly arrayed thread-like strands or filaments. In other stages, it is one of closely packed rods.

This evidence suggests that inclusion bodies are clumps of viruses reproduced in the infected cell.

The thread-like strands may be the immature virus, which consists only of its nucleic acid core. The dense rod-like pattern may represent clumps of mature or nearly mature viruses that have added a protein coat to their nucleic acid core.

The UCLA scientists said this technique of studying the virus within the infected cell may contribute valuable information to the knowledge of the "life history" of viruses. Other virus researchers have employed chemical and centrifuge procedures of extracting the virus from the cell and then studying it by electron microscopy.

• Science News Letter, 78:376 December 10, 1960

庆祝建国十周年

十年来自然科学的重大进展

——为庆祝中華人民共和国建国十周年而作——

杜 润 生

一

勇敢、勤劳而智慧的中国人民曾經創造过灿烂的中国古代文化，产生过很优秀的古代的科学家。中国天文学家关于岁差、岁周期、日月蝕的研究都比欧洲天文学家早得多。紀元前403—221年的战国时代，我国人民就发現了物质的磁性。在第五世紀，我国数学家定圓周率值为$\pi=\frac{355}{113}$，准确到七位数字。十世紀时，我国已制成火药。宋代(十——十三世紀)制成了世界最早的利用喷射气流获得反作用力的火箭。医生华陀在第三世紀时就利用麻醉术进行了一些复杂的外科大手术。不胜枚举的例子表明，古代中国人民对世界科学文化曾有过光輝的貢献。

但是，当世界現代科学不断前进的时候，我們落后了。人們知道，从十七世紀起，現代科学在产业革命推动下开始了逐物的发展。十九世紀及后十年和二十世紀的最初十几年，旧式的蒸汽机开始在很多方面被电动机和內燃机所代替；飞机和无綫电由幻想变成了現实；放射性的发現和相对論、量子論的建立开辟了一个新的时代——原子能时代。但是，在这一期間，中国封建社会长期停滯，随后，帝国主义入侵，民族危机日益加深，国民經济日趋破产，社会的扩大再生产都难以維持，这就造成了科学技术的停滯不前状况。

世界第一次大战爆发，帝国主义不暇东顧的时候，中国的孱弱的民族資本主义經济获得喘息和发展的机会，引出科学研究的一綫生机。五四运动中，科学与民主，曾經成为代表进步思潮的口号。但是在人民民主革命未能彻底完成以前，不論用什么形式提出发展科学的任务，都是不可能实現的。

十多年后，爆发了1925—1927大革命。革命沒有成功，中国走上了革命和反革命艰苦搏斗的时期，直到抗日战爭的十多年时間內，馬克思主义的社会科学，尽管受到統治阶級无比的摧殘，但終于在阶級斗爭的推动和工人阶級的撫育下，在战斗中不断成长起来，有了重大的发展。至于自然科学，則由于当时半殖民地半封建經济和政治結构的束縛，依旧沒有得到发展的条件。如果說有一点发展，也只是在下列各种情况下才出現的：反动統治阶級为了点緩他們的"建設"成績，曾經拿出了少得可怜的一点經費，办了点科学事业，如当时中央研究院、北平研究院的19个研究所，每个研究所的研究人員和輔助人員，合計各只有数人至数十人；帝国主义国家为了侵略中国的需要，也曾办过一些科学机构，例如，1873年法帝国主义派来的传教士在上海徐家汇办了一个天文台，英帝国主义控制的中国海关又委托这个天文台开办了气象工作，当时这个台的工作是向航行于中国沿海的外国船舶报告时刻和天气預測，以保障它們的安全；在个别民族資本家帮助下，还在本世紀二十年代成立了几个私人性质的科学机构，如黃海化学研究所、"科学社"的生物研究所等。这些研究机构在当时十分艰苦困难的环境中，为我国科学工作者提供了进行一些研究工作的条件，使得我国的自然科学在1927年至1937年国民党反革命統治时期中，得到維持生存的机会。此外，这个时期，在高等学校中也曾零星地、自发地进行了极为有限的研究工作。

从1937年起，日本帝国主义入侵，全国进入抗敌战爭。我国原来集中在沿海一帶的科学机构，大部分为日本帝国主义所摧残。1940年前后的7—8年里，

First page of article p. 379 in Chinese

Communist Chinese Claims Regarding Scientific Progress In the Last Decade

With Appended Bibliographic Notes

➤ THE TENTH anniversary of the establishment of the Chinese Communist regime on Mainland China, which took place last year, was the occasion for the publication by the Chinese Communist government of numerous articles proclaiming massive advances within science and technology. These articles, which range from detailed reviews on progress within narrow fields published in the specialized professional journals to general and popularized accounts carried in newspapers, paint a picture of a new China resolutely endeavoring to narrow and close the gap between its scientific and technological level and that of other nations, and eventually to surpass them. The ideological rationale for this endeavor derives completely from Marxism-Leninism—specifically from the hypotheses that science exists solely to serve the State through its ability to improve technology and thereby economic production, that socialist states inevitably are in a condition of conflict with capitalistic states, and that socialist states (and specifically, Communist China) will inevitably triumph.

This ideological framework has given the development of Communist Chinese science a peculiar orientation and character which is difficult for most Western-trained and oriented scientists to understand. Many concepts and values most prized by Western scientists—such as the importance of conducting research for "science's sake," the non-political nature of science in general, and the necessity for scientists to determine their own courses of research and study—are completely rejected. The strangeness of this scientific environment in Western eyes, combined with the great difficulties imposed by the language and the political barriers to the exchange of scientific information, have led to a general rejection of Chinese Communist claims to scientific achievement as well as a tendency to ignore their literature.

The achievements of the Russian scientific community are built upon a base similar to that being established in China. The Russian progress recently warned us of the dangers inherent in the Marxian viewpoint and have indicated the necessity for a closer observance of the development of science in Communist China. In this respect the numerous reviews, surveys, and general pronouncements prepared for the occasion of the tenth anniversary are of great importance and interest both because of and in spite of their frequent excursions into Marxist ideology. These documents clearly indicate the scope of the Chinese effort, the areas of emphasis, the manner in which scientific philosophy has been subordinated to the political ideology and the probable areas of future development.

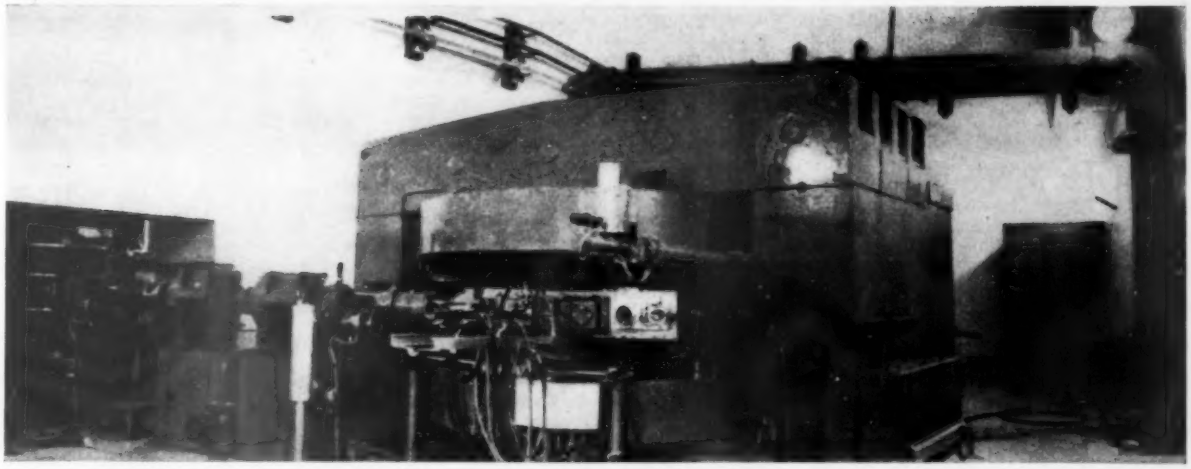
One of the most comprehensive of these documents was published in English by Du Ruen-sheng, Deputy Secretary of the Academia Sinica in Peking, in the November, 1959, issue of Scientia Sinica, Vol. VIII, No. 11, pp. 1196-1217, entitled "Great Progress Made in the Natural Sciences in China During the Last Decade." This document, which appeared in Chinese and English in the original Peking publications, is presented as an introduction both to Communist Chinese scientific philosophy, their claims to progress and achievement and the shortcomings which they have frankly acknowledged. SCIENCE SERVICE, with the financial cooperation of the National Science Foundation, is therefore publishing in SCIENCE NEWS LETTER this statement, uncut and unedited, as a contribution to American understanding of the present state of Chinese Communist science.

No changes have been made in the text other than the insertion of subheadings and footnote numbers referring the interested reader to the appended bibliography of available English translations of Chinese review or summary articles deriving from the tenth anniversary celebration. Although the ideology expressed in this item in no way represents the policies, views, or attitudes of the editors, and although the author's use of English is frequently poor, it was felt that any deletions or amendments would greatly reduce the value of the document.

The list of references to published material and the ability to obtain it in English translation as listed in the bibliography will serve a very useful purpose in giving more detailed information and direct access to these publications.

• Science News Letter, 78:378 December 10, 1960

COMMUNIST CHINESE SCIENTIFIC PERIODICALS—Include Chemical World, Chinese Medical Journal, Chinese Journal of Internal Medicine, Chinese Science (Scientia Sinica), in which the English language version of article beginning page 379 appeared, Science (pictured beneath Scientia Sinica), in which the original Chinese version of article appeared, Oceanography and Limnology, Journal of Water Conservation, and Silt Research.



CHINA'S FIRST CYCLOTRON AT THE ATOMIC RESEARCH INSTITUTE NEAR PEKING

Great Progress Made In the Natural Sciences In China During the Last Decade

Reprinted from Scientia Sinica, Vol. VIII, No. 11.

By DU RUEN-SHENG
(Academia Sinica)

➤ THE INDUSTRIOUS, brave and clever Chinese people created a glorious culture in ancient China and produced many distinguished men of science. Studies in the precession of the equinoxes, the periodical year and the eclipses of the sun and the moon had been made by Chinese astronomers long before the Europeans. During the Warring Kingdoms period (403-221 B.C.), our people discovered magnetism in matter. It was in the fifth century that a Chinese mathematician succeeded in determining the ratio of the circumference of the circle to its diameter as $\pi = 355/113$, correct up to seven decimal places. Gunpowder was first successfully made in the tenth century. The first rocket in the world working on the reaction of gas jets made its appearance during the Sung Dynasty (10th to 13th century). The famous medical man, Hua T'o (141-203 A.D.), successfully carried out a number of complicated major surgical operations under narcosis. Instances too many to enumerate bear evidence to the fact that the ancient Chinese people had made brilliant contributions to world culture and science.

Admit Science Lag

However, while modern science of the world was making continuous advances in recent centuries, we lagged behind. Since the seventeenth century, modern science had begun to develop vigorously under the impact of the Industrial Revolution. In the last decade of the 19th century and the first decade of the 20th, the old-fashioned steam engine began to be replaced by the electric motor and the internal combustion engine; the airplane and the radio turned from mere imagination into reality. The discovery of radioactivity and the founding of the theory of relativity and the quantum theory opened the new atomic era. During the same period, however, owing to the prolonged stagnation of the Chinese feudal society and later on to the imperialist invasion, our national crisis became daily more acute, our national economy headed for bankruptcy and our social extended reproduction could only continue with difficulty. Consequently science and technology remained for a long time in a state of inactivity.

After the outbreak of the First World War, when the Western imperialist countries were too busy to further their plundering in the East for the time being, the very feeble Chinese nationalist capitalist economy had the chance then to take a breath and to develop itself, incidentally giving a spark of life to scientific research. In the May Fourth Movement, "Science and Democracy" was the slogan representative of the progressive thought at that time. But, before the people's democratic revolution could be accomplished in a thoroughgoing manner, the task of the development of science, in whatever form it might be put forward, could not possibly be fulfilled.

Some ten years later broke out the Great Revolution of 1925-1927. It did not succeed, and China then entered into a period of bitter strife between the revolutionary and the counter-revolutionary. In another interval of over ten years until the commencement of the war against Japanese aggression, the Marxist social science at last began to grow continually under the impulsion of the class struggle and the fostering by the working class, and to attain important developments in its battles in spite of the relentless suppression by the ruling class. On the other hand, the natural sciences, on account of being fettered by the semi-colonial and semi-feudal economy and the political structure then prevailing, they remained as before short of conditions for development. Even if it is conceded that they had any development at all, it happened only under the following circumstances. In the first place, the reactionary ruling class gave pitiably small appropriations for running some show of science, such as the former Academia Sinica and Peiping Academy, to decorate their so-called construction. The two institutions together had but 19 research institutes, each of which had from a few to scores of research and auxiliary personnel.

Missionaries Founded Observatory

Secondly, the Western imperialist powers also set up certain scientific organizations to meet the needs arising from their aggressive exploits in China.

For instance, the Catholic missionaries sent to China by the French imperialists founded an astronomical observatory at Zi-Ka-Wei in Shanghai and the then British-controlled Chinese Maritime Customs commissioned them to render meteorological services. The observatory was to send time signals and weather fore-

casts to the foreign vessels navigating the Chinese waters to ensure their safety. Thirdly, a few scientific institutions of a private nature, under the sponsorship of individual nationalist capitalists, were established during the First World War and the subsequent years, such as the Huang-hai (Yellow Sea) Institute of Chemistry and the Institute of Biology of the Science Society, etc. The above-mentioned organizations indeed furnished our scientific workers with certain research facilities in exceedingly difficult circumstances and were instrumental in maintaining the very existence of the natural sciences in China during the period under the Kuomingtang anti-revolutionary rule 1927 to 1937. Moreover, a very limited amount of research work was also carried out sporadically and spontaneously during this period in certain institutions of higher education.

Beginning with 1937, the Japanese imperialist invasion into China threw the entire nation into a war of resistance. As most of the scientific research institutions were then concentrated along the coast, they were all destroyed by the Japanese imperialists. It was during the years of Japanese invasion that the wonderful development of the most advanced modern techniques such as the atomic energy, the radio electronics, etc., took place in the West, whereas in China, apart from only a few individuals doing odd bits of research at home and abroad and a limited number of personnel trained in institutions of higher education, the record of the development of natural science in this period was almost a blank page.

China Started Anew

In the year 1949, thanks to the great victory of the Chinese people's revolution under the leadership of the Communist Party of China, science in China started a new life: it returned to the hands of the people. Fostered by the state under the leadership of the working class, science began a new period of growth.

In the few years from the Liberation of the entire country to 1956, the principal measures adopted for promoting science in China consisted in adjusting and strengthening those institutions which were inadequate and overlapping; in appropriately reorganizing and consolidating the formerly scattered and weak scientific forces; in developing higher education for training new scientific cadres; and in encouraging the scientific workers to carry out ideological self-remoulding on the basis of the principles of Marxism-Leninism. It was in 1949 that Academia Sinica was established, and a plan for the development of science was subsequently formulated. The various ministries in charge of production also established their specialized scientific institutions. The All-China Federation of Scientific Societies was inaugurated. Specialized curricula were readjusted or newly set up in the universities and colleges according to the divisions of modern science and the needs of national construction. Owing to their participation in various politcial movements and in social life, and owing to their study of Marxism-Leninism and apprehension gained personally in scientific pursuits, the scientific workers had in various degrees uplifted their political consciousness to a higher level. In the meantime, Chinese scientists accomplished a number of valuable tasks in scientific research in support of the War to Resist America and Aid Korea and for the rehabilitation and the new development of national economy.

Rapid Advances in Science

The year 1956 was one in which a great victory was won in the socialist revolution in China and one in which rapid advances in Chinese scientific enterprises were made. At a conference convened by the Central Committee of the Communist Party of China on the problems of the intelligentsia at the beginning of this year, Chairman Mao Tse-tung called upon the Chinese scientific workers to struggle for the early attainment to the advanced scientific level of the world. Immediately following this, the Twelve-Year Long-Term Plan for the Development of Science and Technology was formulated under the direct guidance of the State Council. This plan included many important scientific and technical tasks urgently required by our country and laid special emphasis upon certain key problems. In the said plan, appropriate arrangements were also provided for with respect to the organization of scientific research, the establishment of new research institutions, the employment and training of scientific and technical cadres, international scientific cooperation and other problems. Although this plan still remains in draft form, it has in reality become a unanimously-supported programme of action implemented faithfully and conscientiously by our scientific workers in various fields. After three years of exertion, many research tasks and organizational measures stipulated in the plan have already been successfully carried out.

In 1957, on the basis of the completion of the socialist revolution of ownership of means of production, an anti-rightist struggle and an all-people's rectification campaign took place. Both were in fact a socialist political and ideological revolution in which a great victory was also scored on the science front. Through this political movement the broad mass of scientific workers recognized that scientific enterprises should be put under the leadership of the Communist Party, that science should serve socialism and that every scientific worker should handle properly the relations between theory and practice, between the individual and the collective and between the specialists and the masses. Thus was laid the ideological foundation for the realization of a big leap forward in scientific research.

During this period, scientific and technical cooperation between China on the one hand and the Soviet Union and other fraternal socialist countries on the other was further developed and strengthened, thus enabling us to receive continuous fraternal helps from these countries.

In 1958, the Central Committee of the Communist Party proposed formally to the entire Party and the entire nation the general line of "going all out, aiming high and getting greater, quicker, better and more economical results to build socialism," and at the same time called upon the people to put politics in command, to emancipate the mind, and to set up the communist style of daring to think, to speak and to do things. Thus, the socialist revolution penetrated a step further into the ideological realm. The revolutionary enthusiasm, the initiative spirit and the subjective activity of the broad mass of the people manifested themselves at once. And the situation of an overwhelming nation-wide big leap forward in industrial and agricultural production immediately took shape.

The thoroughgoing socialist revolution greatly liberated the social productive forces. The question: "Can science march forward with a high speed keeping up with the demands of the general line?" was then posed before the scientists in China, demanding an immediate answer. The answer was soon found and this was that in scientific and technical matters, if politics is put in command and if ideology is put in command; if we rely on man's own initiative and active spirit instead of on the use of material stimulations as the only expedient; if we bring about a combination of the research work of scientific institutions and the movement of technical innovation on the part of the broad masses, a combination of the specialists and the great masses and a combination of the militant zeal for work of the young scientific workers and the positive functions of the experienced scientists; and if we do not depend only upon the small number of specialized research institutions and the small number of specialists and experienced scientists for the carrying out of scientific work, in short, if we take the mass line in scientific work, a great upsurge in the march on science will definitely be brought about and a rapid advance in science will be attained.

Outlook Changed

It is now obvious that the mass line has given rise to great changes in the outlook of science in our country. For example, with the broad mass of the people cooperating with botanical workers in tackling the problems of the investigation and utilization of wild plants (1), more than a thousand kinds of wild plants were discovered and put to use in 1958 alone, and it is expected that the general survey of wild plants in the extensive territory of this country will be practically completed by the end of this year. If we are to conduct a survey of such great dimensions with the old methods, it will have to take years to complete. As another example, young scientific workers working together with experienced scientists in the research of optical instruments had developed the making of eight kinds of extremely complicated instruments of high precision in only a few months in 1958, a task that would take a number of years to develop even in the scientifically advanced countries. There is also the successful isolation of many kinds of rare-earth elements by the young research workers in the Institute of Chemistry, which took them only ten odd

days of intensive shock work. If such a problem were tackled in the traditional way, it might take many years without getting a satisfactory solution in the end. It is worth while to give the above examples, because some of the work was carried out in the midst of controversy. At that time, some people, mostly scientists of the older generation, were sceptical about the possibility of carrying out the research project in a short time, while some others, mainly youthful scientific workers, positively insisted on working through to a successful end. Eventually, after a year of trial, it is well proved today that the youthful people are correct and the proposition that scientific work can also follow the mass line is definitely a sound one.

To be both red and expert, that is, to be politically mature and professionally proficient, to serve socialism, to bring about a big leap forward, to follow the mass line, such are the directions of advance pointed out to our scientific world by the general line.

Development of Natural Science

Planned development of science is a characteristic and also a great merit of the scientific undertakings in socialist countries. In order to make clear the current situation of the development of natural sciences in our country, it is necessary to render a fuller account of it.

The development of science according to plan has a special significance for China, because our foundation of science has been a very weak one. To bring our science with such a foundation to the advance world level, it is essential that we should by all means make full use of all the virtues offered by the socialist system. Thus, we cannot but seek to avoid the state of anarchy in scientific work and stress the importance of the development of science according to plan.

Our plan for the development of science was formulated with a view to meeting the long-term needs of our socialist construction. In the process of its formulation and putting it into effect, we have also paid special attention to the following concrete demands: 1) to lay stress on the proper relationship between science and production and to implement the principle of the unity of theory and practice; 2) to fully utilize the scientific resources, devoting our main strength to those aspects which are most significant and most urgently required.

The development of the natural sciences is basically determined by the requirements of the actual production practice. Separated from social requirements, the natural sciences would be totally devoid of significance. To know Nature is for the purpose of transforming it to satisfy the requirements of production. Some maintain that "scientific research would not in the least tolerate utilitarian considerations". In saying this, they forget that all the current scientific inventions in the world are without exception directly related to social requirements and therefore inseparable from considerations of utility. In the world of today, the difference in the question of utility lies only in whether it is for the capitalist or for the people. It is either this or that, but no other. The slogan "science for science's sake" is incorrect. Each and every scientist should clarify his own attitude and take a definite stand as to which class and what nature of production he works for and to which kind of society he is dedicating his work. In so doing, the freedom of scientific exploration will not be affected in the least. On the contrary, that freedom is being encouraged and promoted.

It is indeed our great fortune to find that the socialist economic construction of our country now being developed in full swing is providing for us a production background that is growing stronger and stronger. The continuous implementation of technical innovation in socialist production not only is itself a fundamental propelling force for the advancement of science but also offers conditions under which an abundance of research data and laboratory equipments may be secured. All these are beyond the dream of old China. Scientific research of new China serves her socialist construction and at the same time serves science in its advancement. Thus scientific research must be closely linked with production practice.

Of course, the linking of science and production must not be understood wholly as a sort of hand-in-hand relationship or body-and-shadow relationship. The results of some of the fundamental researches can be made use of in production only through certain other disciplines of science, the relationship between fundamental research and production being often of an indirect nature. Some researches are related to the requirements of production of tomorrow, others are related to production of a general nature and have bearing on basic principles, while still others are only instrumental in the exploration of new directions of scientific development. But all these researches are indispensable for the continuous innovation of production technique. It is precisely for this reason that our Party and government have constantly been emphasizing fundamental theoretical research.

Twelve-Year Plan

Based on the aforementioned basic understanding, we adopted the following method in drafting the Twelve-Year Long-Term Plan for the Development of Science and Technology. The tasks of scientific research are formulated according to whether they meet the requirements of the development of national economy. Each of the main tasks of scientific and technical research aims at fulfilling a certain major technical requirement in economic construction. Such requirements are to be met not only through research in one single scientific discipline but also through the mutually coordinated efforts of many disciplines, whereas the theoretical research of each discipline is to be carried out round these tasks. Thus, the development of science is closely integrated with the requirements in national production and national construction. Lest subjects of fundamental theoretical research might be inadvertently left out, certain important fundamental theoretical problems are especially included as tasks in the plan. Besides, plans for certain important fundamental disciplines are also provided, subordinate to vital scientific and technical tasks.

Why do we stress the importance of the concentrated use of our scientific resources? It is because our plan for the development of science necessarily reflects the all-inclusive requirement of our socialist construction,

STUDENTS BUILD ELECTRONIC COMPUTER—At Chinese University of Science and Technology, set up in Peking in 1958 to train research workers in the most advanced branches of science.

namely, to strive for high-speed development. In other words, to make full use of the comparatively small and feeble scientific resources now available to do more and greater things in the shortest possible time.

China is a big country with a population of more than six hundred million. For the purpose of building an advanced scientific organization in the country so that we may be able to rely on our own strength to resolve all the scientific and technical problems in the prosecution of our large-scale socialist construction it is absolutely necessary that all the departments of science must have a balanced development. Now, the development of modern science has expanded its sphere of research to such unprecedentedly vast proportions. And, as a late comer, China has but scanty scientific resources. Under such circumstances, there are two possible courses we may take: either we adopt a policy of giving priority to the development of special-emphasis subjects with due attention paid to the others, so that we may concentrate our limited and not too strong resources in the directions that are the most useful, the most significant and the most productive of results, or otherwise, we use our strength evenly in all directions and leave out none. Which course is the better and the quicker? We have chosen definitely the former. Experiences in the past few years show that when we hold fast on certain most important objectives in the pursuits of science, other objectives that are only of secondary importance will be influenced thereby, with the result that they too would move forward. If we could get hold of the central links in the chain of science development, we should then be able to set in motion the remaining links without any difficulty. Should we distribute our forces evenly over the entire front, we should find that all our positions were but poorly guarded and we had to suffer losses.

Science for the Economy

There are two fields of scientific research which call for a greater concentration of our strength. In one field are the scientific problems of great significance in our national economy, including those concerning the utilization and exploitation of natural resources, those bearing on technical innovations in departments of industry and communications, those relating to agricultural production, etc. (2-7). Any one of these problems not only involves a huge amount of work but includes quite a number of inquiries of theoretical significance as well. For example, to raise a bumper crop, there is involved a number of theoretical problems relating to cultivation techniques, seed selection, plant physiology, etc. If all these problems are successfully resolved, then quite significant results will be obtained and the science of high-yield agricultural production, biology and agronomy will be raised to a much higher level. It must be pointed out, however, that our work is by no means confined to these endeavours only, and there are further demands, namely, to industrialize our agriculture so as to convert by degrees manual labour into mechanical operations, and accordingly to bring along rural electrification, chemification and overall scientific management. As regional peculiarities are a predominant feature in agricultural production, it is therefore of little use for our agriculture merely to take over the available techniques of foreign countries. Consequently it becomes necessary for us to carry out an enormous amount of systematic and original scientific research. And this is the responsibility of our scientists. Similar conditions exist also in domains other than agriculture, such as geological prospecting, exploitation and utilization of water resources, metallurgy and others. To concentrate our scientific resources in these problems is entirely necessary and the results obtained therefrom will definitely be considerable.

Another important field of problems which we should get hold of consists of certain new techniques and important border line sciences, such as nuclear technique, computing technique, semi-conductors, radio-electronics, automation, chemical physics, biophysics, etc. All these are now developing fast, being the spearheads of the science front in its march forward and the new growing points in the development of scientific theories, and in consequence they are inevitably the domains where we shall reap the richest harvests and the directions in which victories can be easily won. However, it is precisely in these directions that the scientific forces we used to have are the weakest. Thus today, unless we concentrate our forces with the greatest shock spirit, nothing can be achieved.

Review of Developments

Now let us review briefly the developments and accomplishments of the natural sciences in the last ten years in the light of the basic requirements for the development of science in our plan mentioned above. As it is impossible to relate all the achievements in detail within the limited space, we shall then give an account in general outline below.

Socialist economic construction should be carried out under some plan. It requires the full utilization of our rich natural resources and favourable natural conditions as well as the rational allocation of productive forces in different regions. In the series of investigations and studies to be carried out for the fulfillment of these tasks, complex expeditions play an important role (8). This undertaking requires synthesis of the research results of all the departments concerned and a huge amount of organization work, both of which are time-consuming tasks.

In the past ten years we have sent from time to time a number of complex expeditions to study and investigate Tibet, the Yellow River, the Amur River (or Heilungkiang), Sinkiang, Chinghai (Koko Nor) and Kansu, and the Tsaidam salt lakes, and also to take up numerous important problems, such as the diversion of the southern streams to the north (that is, diversion of the surplus water from the Yangtze River northward to the Yellow River basin), the utilization of the glaciers and snow cover on the higher mountains, the fixation of the sand dunes, the survey of the tropical biological resources of South China and Yunnan Province, the pursuit of oceanographical studies and so on. Now, whether in the number of scientific disciplines involved, or in the immensity of the areas covered, or in the enormousness of their scope, these expeditions are unprecedented in the history of science in China. Participants in these expeditions include not only our own scientists from various ministries and departments but also a number of Soviet scientists. These undertakings are of great significance to our national economy and also of immense value to science. The important directions for our endeavours from now on will be the creation and expansion of our specialist forces and the strengthening of the scientific analytical work and the processing of the data and materials obtained.

In addition to the complex expeditions mentioned above, a large number of surveys and investigations of a specialized character in the earth sciences and the biological sciences have also been carried out.

Geological Research Began Early

Geological research work began at a comparatively early date in our country, but because of the shackles imposed by the old social system, the science of geology was divorced from practical needs and remained undeveloped for a long period. During the 40 years prior to the Liberation, geological prospecting was limited to only 18 kinds of minerals. Under such circumstances it is not surprising that absurd statements such as "China lacks mineral resources", "China is poor in oil and copper", "There are no coal deposits south of the Yangtze River", etc., were fabricated by scholars in the employ of imperialist interests.

Now, in the face of realities all these lies and nonsenses have been utterly shattered. During the short period of ten years after Liberation, Chinese geological workers have newly found 88 kinds of mineral deposits in our country in prospecting. It has been positively proved that China is a country with very rich mineral resources. Rich deposits of important minerals such as iron, coal, petroleum, copper, manganese, tin, aluminum, zinc, mercury, tungsten, antimony, molybdenum, etc., have been discovered (9). For instance, in Kiangsi, Kwangsi and Honan Provinces, regions formerly considered to be lacking in iron and coal, deposits of both with great economic value have now been found. Large oil fields have been discovered in the Northwest and the Southwest. The oil fields have also been found to possess a much greater reserve than formerly estimated. In recent years, large ore beds of rare and dispersed elements have been found by prospecting. Making use of the abundant data and materials accumulated in the course of prospecting work, research work in ore deposits has also greatly advanced.

A foundation has already been laid in China for the important branches of science like geochemistry, geophysical prospecting (10-12), hydrological geology and engineering geology.

Even greater strides are being made in geophysical observation work (12). The

WOODEN RICE PLANTING MACHINE—Invented by Tai Mao-yang, a doctor in Fukien Province, is being tested in the Peking Research Institute of Agricultural Machinery. Four types of rice planting machines will be popularized among rice growers in China.

total number of meteorological observatories and stations in the country has increased to more than 21 times the figure immediately after the Liberation (13-14). In short-range weather forecasting and the prediction of weather adversities such as cold waves, rainstorms, frostbites and gales, the accuracy has been greatly enhanced as a result of systematic researches (13-24). From 1953 onward, we have also gradually established facilities for forecasting summer precipitation.

Seismologists cooperating with historians have systematically collated all the historical data about earthquakes in China beginning from 1189 B.C. and determined the intensity of earthquakes in many industrial cities and districts under construction.

A good many kinds of scientific maps, charts, monographs and documents have been compiled during the past ten years on the basis of the abundant data and materials accumulated in large scale investigations and surveys together with the utilization of the past research results. The more important documents consist of the schemes and specifications of China's natural division as well as geomorphology, climatology, hydrography, pedology, vegetation and fauna. In connection with the division work of this country have been compiled the 1:4,000,000 vegetation map, soil maps, geomorphological maps, map of Quaternary deposits and division schemes and specifications of hydrological geology of China. Other works completed include a 1:4,000,000 geotectonic map, a treatise on the outline of the tectonics of China, a treatise on the mineral ore deposits of the Northwest of China, a palaeogeographical map of China, etc. Very recently a number of works on the flora of China (one volume each for the *Pteridophyta,* the *Gymnospermae,* the *Cyperaceae,* the *Aceraceae* and the *Scrophulariaceae)* and on the economic fauna of China (one volume each for helminthology, ornithology and mammalogy) have been compiled, these being dedicated by the Chinese botanists and zoologists to commemorate the tenth anniversary of the founding of the People's Republic of China.

A Decade of Industrial Construction

In the past ten years, our scientists have done a lot of work about the immediate needs of industrial construction in three domains: 1) multiple utilization of important natural resources, 2) improvement and advancement of production techniques and 3) supply of scientific data with which to design large-scale engineering construction projects. In carrying on the work in these domains, we have inaugurated studies in fuels, power engineering, electrical engineering, mechanical engineering, etc., and we have also developed research in metallurgy, ore dressing, civil engineering, architectural engineering, hydraulic engineering, etc. None of these studies could have developed in old China. In the deplorable past, there were few institutions of higher education for training scientific personnel in these specialties, still less facilities for scientific research. After the Liberation the People's Government took immediate action and hastened to bring about a change of such a lamentable state. In paying the greatest attention first of all to the establishment of factories and schools, the Government also launched programmes of scientific research even though the manpower then was in an extremely strained condition. It may now be said that a fairly adequate foundation has already been laid for the development of production, education and research, and of the three, research work is to grow in proportion by degrees.

After ten years of exertion, our techniques in ferrous metallurgy (25-26), so far as the utilization coefficients of blast furnaces and open-hearth furnaces are concerned, now rank among the world's most advanced. The technique of three-tapping troughs for steel smelting is an outstanding Chinese invention. The newly-developed small blast furnace and small converter embody also many original technical features devised by the mass of people and adapted to characteristic local conditions. Preliminary solutions have also been reached in the problems of the smelting of complex iron ores containing fluorides, titanium-containing iron ores and high phosphorus content iron ores. In non-ferrous metallurgy (25-26), the technique of fluidized bed roasting has successfully been introduced in the zinc-smelting industry and will soon be introduced in copper-smelting. Researches in hydro-metallurgical methods for ores containing copper oxides difficult to dress have greatly increased the recovery rate of copper.

In the course of the big leap forward, we have practically built up a new metallurgical system for alloy steels suited to the conditions of our natural resources that require the economy of nickel and chromium. Systematic researches have also been conducted in regard to special alloys.

Techniques For Liquid Fuels

For increasing the sources of our liquid fuel supplies (27), researches in the low-temperature distillation of shale and coal have resulted in an improvement of the design of the retorts with conspicuous success. The hydrogenation of coal tar and the medium-pressure gas synthesis for the production of liquid fuels and other chemical products are outstanding achievements in research. And in the course of the research in the latter projects, catalysts with higher activity have been discovered, with which the yield of hydrocarbons above propane is 191 grams per cubic meter of carbon monoxide and hydrogen. Remarkable advances have also been made in the chromatographic method techniques which are indispensable for petroleum analysis.

In our power engineering techniques an all-round improvement has been obtained. At present we have already mastered the techniques of designing, manufacturing, and construction for hydroelectric stations of 1,000,000 kilowatts capacity and thermal power electric stations of 450,000 kilowatts capacity, as well as the designing and manu-

facture of new-type free-piston gas turbines.

Our electric power technology is now heading for big power systems, high-voltage generation and transmission and automation (28-32). For the improvement of the performance of large-type power equipments, we have commenced experimental research work on the hydrogen and liquid cooling in the interior of electric machine conductors so that their capacities will be conspicuously raised. We have studied a series of problems of the high-voltage power transmission systems of 330 kilovolts and have also completed the designing work for the automation of the power systems in the Northeast.

In machine-building technology in the past ten years we have radically changed the former backward condition of being capable only of doing repair work and entered into the designing and production of various kinds of large-type and precision machineries (31). In the casting of machine parts, attempts have been made to produce them by employing the permanent melting mould technique. Our indigenous method of clay-mould casting, after having been studied and improved upon, can now be used in the iron-casting shops in place of the sand-mould casting requiring one mould for each cast so that the production rate has been multiplied threefold. Advanced technological processes such as the thin-shell clay mould casting, the casting of large-sized machine parts and pressure-casting of light metals, etc., have all been adopted in the factories. A research system is being built up to delve into the theories of the strength of machine parts.

Develop Processing Techniques

Achievements have also been made in a series of processing techniques. Citable examples include researches on hot-rolling of gear wheels and threaded rods in the field of pressure processing; the popularization of ceramic cutters in metal-cutting processing; the successful trial making of electric pulse processing lathes in electrical processing and the invention or improvement of friction welding, electro-slag welding and pile welding in the field of welding processes.

In the past ten years, systematic studies have been made for the improvement of the treatment, processing and mechanical properties of spheroidal-graphite cast iron, thus greatly extending the sources of raw materials for the machine-building industry.

In regard to optics and fine mechanics, a series of high-precision instruments have been successfully produced, such as the large-type electron microscope with a resolving power of 25 Å and a magnifying power of 100,000; the automatic-recording infra-red spectograph; the new-type universal tool measuring microscope; the wide range phase contrast microscope; the large-type interferometer, etc. In optical systems certain conditions of the formation of high order aberrations have been clarified, and as a result the ultra-large aperture F/0.8 photo-objective with a viewing field of 40° and the F/2 continuously variable focus objective with a maximum viewing field of 60° and a focal variation of 1:5 have been successfully designed.

We have also carried out researches on the making of optical glass containing rare earth elements.

Keeping up with the requirements of post-Liberation large-scale capital construction schemes, the scientific and technical levels of civil and architectural engineering have been brought to new heights (30), (32-36). A comparatively large quantity of work has been done in the theories of structure. The study of pre-stressed reinforced concrete structures has been advanced and its results obtained have been put to application. In large-span structures for civilian use, the thin-shell structure of reinforced concrete has been introduced and the largest span of cylindrical long-shell structure has reached 55 metres. For the economy of steel bars, timber and cement, a number of substitutes have been found. In the railway (32), highway and bridge construction projects (34), the high-power directional explosion technique and also the reinforced concrete colonnade foundation method initiated in the building of the Yangtze River Bridge at Wuhan have been widely introduced.

Workers in soil mechanics in their study of the characteristics of loess and clay have made new progress both in theory and in research method (37).

In connection with the series of hydraulic engineering construction and the vast-scale construction tasks of the key hydraulic project at the Sanhsia Gorges of the Yangtze River, a large number of model experiments in hydraulic engineering and stress analysis have been carried out in addition to the on-the-spot experiments of concrete pouring of immense volumes. Scientists have also obtained results in the research in the silt disposal by density currents. They also submitted a proposal for the revision of the designs of the sluices for the key hydraulic project of Sanmenhsia and it is estimated *ad interim* that the adoption of this proposal would make it possible for the Sanmenhsia Reservoir to commence the disposal of silt ten years earlier than originally designed.

Mention should also be made here of the rapid development of the research on silicates (38). The production techniques and the quality of cement, refractory materials, glass and ceramics have been considerably improved.

Increase Agricultural Production

Ever since Liberation, agronomists and biologists, with a view to increasing agricultural production and to supporting the movements of agricultural collectivization and the people's communes, have gone into the country, summed up the experiences of the peasants in bringing forth high yields and inaugurated extensive experimental and research work. Since 1958, several hundred working bases have been established in the extensive rural areas by the different agricultural and biological research organizations and institutions of higher education to carry out systematic summing up of the experiences obtained in connection with the measures for increasing agricultural production based on the Eight-Point Charter (that is, water conservancy, application of fertilizers, deep ploughing and soil improvement, seed selection, close planting, plant protection, reform of tools and field management), and on the basis of this summing-up to initiate multifarious new research projects. The integration of the specialized researches of the scientific workers on the one hand and the technical innovation movement of the mass of the peasantry on the other has the exceptional advantage of supplementing each other in their effort to increase agricultural production.

Claim 400 Superior Varieties

Agronomists in China have succeeded during the last ten years in selecting more than 400 superior varieties of farm crop seeds. One of these that has been introduced widely into many areas is the new variety of winter wheat known as "Pi Ma No. 1", which has raised the output by about 20%.

Agronomists in various parts of China have been working for the reform of cultivation methods, and, owing to the introduction of measures for the conversion of rice cultivation from one harvest to two harvests a year, the replacing of intercropping by successive cropping and the planting of *Oryza sativa* subsp. Keng instead of *O. sativa* subsp. Hsien, remarkable results have been obtained. Chinese soil scientists working together with the broad masses completed the soil surveys for 19 provinces, covering 79% of all the land under cultivation (39). Researches on the amelioration of saline soil and lateritic soil yielded good results. Very good improvements have been obtained in the methods for the preparation and application of organic fertilizers. Nodule bacteria of the soya bean and peanut and other microbial fertilizers have been extensively used. The success gained in researches in antibiotic fertilizers has enabled us to control certain plant diseases and promote the growth of the crops.

In plant protection, plans for reconnoitring the locust pest and for its effective control have been formulated to furnish a scientific basis on which the locust threat which is as old as this country's history may be eventually exterminated. For the control of orange wheat blossom midge, effective measures have been found in spraying hexachlorocyclohexane and in treating soils with chemicals. Measures for the forecasting of insect pests of the cotton plant have already been applied throughout the country. The spread of the late blight of potato, through the institution of prediction and forecasting systems and by the elimination of the primary infection foci and other measures, has been effectively arrested. Measures for the prevention of wheat rust, wheat black stem rust and wheat stinking smut, etc., have been discovered through research. To combat the red leaf disease of the foxtail millet, it has been conclusively found out that the origin of this disease is a virus propagated by a species of aphids and corresponding preventive measures have been suggested. Ten research units working in collaboration summed up the experiences of the masses in the use of indigenous agricultural insecticides, and consequently a book entitled "Chinese Indigenous Agricul-

tural Insecticides" was compiled and published toward the end of 1958.

In forestry research, too, noteworthy results have been obtained. Four new varieties of poplar (Populus spp.) have been bred which grow 30% to 80% faster than their parent plants and are resistant to diseases and strong in adaptability. Other research projects have resulted in the formulation of a series of measures for the forecasting of forest fire hazards suited to actual conditions in China.

Chinese veterinarians have developed many attenuated bacterial vaccines and viruses for the prevention of certain important plagues of livestock and poultry. As a result of researches culminating in the development of the lapinized rinderpest reactor virus and ovinized rinderpest virus, rinderpest, a prevalent plague of long historical standing in China, was virtually exterminated throughout the country in 1956.

In aquatic products, our algologists have successfully unfolded the life cycle of porphyra *(Porphyra tenera* Kjellm), thus resolving the key problem in the cultivation of this edible alga. Experiments for the transplantation southward of kelp *(Laminaria Japonica* Aresch.) have been crowned with success and large-scale cultivation has already been started in the coastal waters of Kiangsu, Chekiang, Fukien and Kwangtung provinces. For the solution of the problem of the supply of fish fry, scientific workers made experiments on the artificial ovulation of *Hypophthalmichthys* molitrix and *Aristichthys nobilis* and obtained successful results in 1958. Very recently they have found another method in making the above-mentioned two varieties of fish spawn in pools and ponds by the combined use of hormones and certain ecological stimulations.

The widespread introduction of castor-oil plant silkworm *(Attacus ricini* Boids) has been a success after the problem of keeping the insect over the winter had been solved, thus ushering in a new branch of sericulture in China.

Traditional Medicine Valuable

In the course of the past ten years, a number of research undertakings in the medical sciences have been concentrated in the prevention of certain parasitic and infectious diseases seriously endangering the health of our people (40-88). The deplorable conditions of the serious harms done by schistosomiasis to the people in the past are familiar to many, but at present this disease has been practically wiped out in approximately 60% of the former areas of prevalence (74). The prevalence of kala-azar, filiariasis and malaria has been brought under control in many areas (72-74).

A series of research work has been carried out for the improvement of the working conditions of the cadres and workers and for the control of the principal professional diseases (82). Preventive measures against silicosis and occupational poisoning have shown conspicuous results. After the emergency resuce of Ch'iu Ts'ai-k'ang, the steel worker who suffered severe burns over 89.3% of the total skin area and was cured in 1958, notable results have been scored in the treatment of many patients suffering from burns over large skin areas.

A very large amount of work has been done in the past few years in uncovering, studying and summing up our valuable heritage in traditional medicine (83-84). The treatment for acute appendicitis, the withering therapy for internal hemorrhoids, the "thread-drawing method" for the curing of anal fistula, the treatment to remove edema in chronic nephritis, the treatment for reducing the ascitic fluid in cirrhosis of the liver as well as the clinical experiences of acupuncture against pains, inflammations and acquired deafism, of Ch'i Kung therapy against peptic ulcers and other chronic diseases, of massage therapy for the treatment of acute sprains—all these traditional healing methods offer new data and materials for and suggest new approaches to theoretical research that has aroused wide-spread interest in the medical world.

In materia medica (85-86), the research work of antibiotics has been most actively developed in China. We used to depend entirely upon imports for all our needs of antibiotics before the Liberation, but today we have fully mastered the techniques for the production of many kinds of common antibiotics (85). The researches into the physiology of *Streptomyces aureofaciens* and into the production of aureomycin have enabled us to increase the output of aureomycin. A new antibiotic against cancer, actinomycin K, was discovered in 1957 from certain kinds of soils in this country and its trial production was successfully carried out in 1958. A successful result in the research work in the field of pharmaceutical synthesis is the manufacture of cortisone and cardiazol, specific medicines for rheumatic arthritis, from certain plants of the family *Dioscoreaceae*.

At the time when the Twelve-Year Long-Term Plan for the Development of Science and Technology was formulated in 1956, a decision was made to concentrate our resources to reinforce the study of certain new technical subjects of great significance that were either non-existent or still very weak. And after a lapse of only three years the speed of advance in the study of these subjects is much higher than we expected. Here are some instances.

Russia Helped Build Reactor

The 7,000 to 10,000 kilowatt heavy-water type experimental reactor, the largest in Asia, which the Soviet Union helped us to build, and a cyclotron which can accelerate alpha-particles to 25,000,000 electron volts have been in formal operation for more than a year. Several kinds of small-type accelerators of our own design and making are also in operation. Moreover, we have also designed and manufactured various kinds of good quality beta-spectrographs, heavy particle spectrographs, gama-spectrographs, neutron spectrographs, etc. As a result of systematic research, the making of nuclear emulsions and counter tubes has attained a very high level.

Researches in the chemistry and in the technical use of radioactive isotopes have been set up from nothing. We have already succeeded in making more than 30 kinds of isotopes including phosphorus 32. The techniques in the use of isotopes have already been introduced extensively to industry, agriculture, medicine and other scientific and technical fields (87).

The development of semi-conductor phys-

TRADITIONAL CHINESE—The Weising People's Commune has its own hospital and a traditional Chinese medicine clinic. A traditional Chinese physician and a druggist work together in the pharmacy.

ics has also been very rapid. Prior to 1956 researches were carried out in a limited scope in regard to semi-conductor current rectifiers and semi-conductor photosensitive electric resistances. Beginning in 1956 we started the extraction of germanium and introduced the zone melting purification technique and the making of single crystals. Then we began to use germanium to make alloy-junction medium-frequency triodes, point-contact diodes, gold bonded diodes, etc. Research on new semi-conductors also started at the same time.

In the past two years, with the assistance of the Soviet Union, we have successfully carried out the trial-making of a universal large-scale high-speed electronic digital computer with a speed of 10,000 operations per second, three addresses and a storage capacity of 2,048 words.

Computer Technique Developing

On account of the demands made by the atomic energy techniques, electronic computers (88), multi-channel communications, detection and ranging, remote control and other new techniques, the work in radio-electronics and especially in the fields of electric pulses and microwaves is expanding rapidly in scope. Researches in the theory of microwaves and the theory of waveguides, in electron optics and in cathode electronics have all been developed. Results have also been obtained in the making of micro-wave measuring instruments, microwave cyclotrons, mass spectrographs, etc.

Following the development of radio-electronics, ultrasonic technology has also been rapidly built up. In the course of the big leap forward many kinds of ultrasonic equipments were produced, including defect detectors, geological prospecting instruments, mechanical processing machines, etc. In addition, scientific workers have also successfully resolved the acoustical problems of the Great Hall of the People which was newly built in 1959 with a seating capacity of 10,000 people.

Among the important achievements made in the course of the big leap forward, those in automatic control and telemechanics should be included. High quality composite telemetering and remote control units composed of contactless elements and electronic analog computing equipments of various types have been made, some of which have already been used in the design of control systems. In 1959, an automatic chemical analyzer and an automatic power system swing curve computing equipment were made.

Fundamental Research

Fundamental research aiming at building a foundation for further scientific theoretical development had received due emphasis ever since the first day of new China. Our scientists had devoted their main efforts during the last ten years to master the existing scientific achievements in the modern world on the one hand and to collect data and materials for study, to set up research facilities and to train scientific personnel on the other. Owing to these efforts we have been able to build a firm foundation for fundamental research and proceed along the direction of healthy development. Shortcomings in science research in the past, such as "theory for theory's sake" in utter disregard to its application, research without any well-defined objective, have been or are being overcome so that the scientific workers now emerge from the dingy little alley, step onto the big open boulevard and march triumphantly towards great and far-reaching objectives. In the following we shall give a brief account of the research activities in the major fundamental sciences.

Mathematics Strengthened

In mathematics (89-92), those branches which were formerly weak or void but are very closely related to our national construction, such as differential equations, the theory of probability, mathematical statistics, computational mathematics, cybernetics and mathematical logic, have now been respectively strengthened or established. In partial differential equations we lay emphasis on researches in non-linear partial differential equations. After the big leap forward of 1958, Chinese mathematicians have been paying greater attention to the relations between mathematics and other disciplines of science and using mathematics as a tool for solving many concrete problems in production. This should be considered a progress of the greatest significance made in the Chinese mathematical world. In the theory of the functions of several complex variables a series of work of a pioneering character has been done and a general, and in a certain sense complete formula has been obtained (91). In regard to the research of the basic problems of the characteristic class and the imbedding class in topology, fairly complete results have been procured. In the researches on geometry of the space of *K*-spread, the geometry of the general metric space and curves in a projective space, a series of new theorems have been proved (92). New advances have also been made in the theory of one variable functions, the theory of numbers and algebras.

Plastic Research Strengthened

In mechanics, researches in plastic mechanics, fluid mechanics and chemical fluid mechanics which used to be either very weak or totally void before Liberation have been strengthened or built up.

In astronomy, researches newly set up or strengthened after Liberation include longitudinal variations, the calculation and compilation of astronomical almanacs, solar physics, stellar physics, radio-astronomy and other branch fields.

In physics (88), (93-96) the nuclear theories and theories of elementary particles have received due attention. We have improved the methods of calculation for the shell-model nuclei and proved that the theory of universal V—A Fermi weak interaction is superior to all the other types (including the Yukawa type) of theories of universal weak interaction. At the Joint Institute for Nuclear Research at Dubno in the U.S.S.R., Chinese and Soviet scientific workers working in cooperation, under the guidance of Soviet scientists, have in a comparatively systematic way studied the problem of how to determine experimentally the spins and relative parities of the strange particles.

In physics of solids (95), researches in physics of metals, semi-conductor physics and solid luminescence are no longer blank spots. Magnetism and X-ray crystal analysis which had some foundation before Liberation have witnessed new developments. In the physics of metals, the problem of the internal friction in metals has been studied. In the field of semi-conductor physics the spectral distribution of photoconductivity of germanium has been studied and an effective method for the measurement of the surface recombination velocity has been proposed. In X-ray crystal analysis, we have studied the crystalline structural change of the π-phase in the tertiary Al-Cu-Ni alloy system. Since the big leap forward of 1958, important advances have been made in the researches about ferrites, solid luminescence and the growth of crystals. Many kinds of ferrite storage elements, high-frequency magnetic cores and micro-wave units have been made. We have already made a kind of material of field-induced luminescence with an efficiency reaching 15 lumens per watt and another kind of long-duration luminescence which still retains a brightness of 21×10^{-4} apostilb after 13 hours, while techniques for the growth of crystals have been mastered by many departments. Owing to the aforementioned researches new fronts in the theoretical research of physics of solids in China are being opened up.

Spectroscopy is another branch in physics that has made significant advances, among which an important achievement is the spectral analysis of rare earth elements (97). Molecular spectroscopy has also received due attention in recent years.

Steps Taken to Provide Facilities

For the development of research work in low-temperature physics and high-pressure physics, positive steps are being taken to provide the necessary technical facilities.

In chemistry (27), (97-103), the fields which had foundations have been strengthened. On the other hand those fields, such as analytical chemistry (98), rare elements chemistry, high polymer chemistry (103), basic organic synthesis and element organic chemistry (98), which were weak or had no foundation at all have developed at a phenomenal speed. Important results achieved include the mastery of the techniques for the extraction and isolation of rare elements and rare earth elements and the making of high polymers of silicon and fluorine, polyaldehyde, polyethylene, polymethylmethacrylate, butadienestyrene and butadiene-vinylpyridine synthetic rubbers, several kinds of polyamide and polyethylene resins and different kinds of ion exchanger resins (103).

Researches in chemistry of natural organic compounds and pharmaceutical chemistry which had comparatively good foundations formerly have all shown advances (85). Researches about the molecular structure of citrinin and that of Fritillaria alkaloids have been very carefully carried out.

In addition to the above, a series of theoretical problems have been studied.

These include the different kinds of catalytic reactions, chemical kinetics, the determination and distribution of the molecular weights of high polymer compounds, complex reactions, physico-chemical analysis, theory of chemical bonds, structural chemistry, etc.

Foundation for Biophysics Laid

In biology (104-109), the new tendency is to open up new fields of research through the introduction of new techniques and to make use of the results made in modern physics and chemistry. Some foundation for research in biophysics has also been laid in recent years. Researches in the electrophysiology of nerves, central nervous system and vision have been developed and some valuable results have been obtained (110).

In biochemistry (100), studies of proteins and enzymes are comparatively thorough. Research in nucleic acid has begun to attract the attention of the scientists.

Researches in genetics consist mostly of the genetics of agricultural crops (1). In the heredity of animals, systematic analysis has been made in regard to the domestication of the goldfish. Research in radiation genetics has begun to develop gradually.

Chinese microbiologists engaged in the researches of the induced adaptation in yeasts have obtained strains of yeasts adapted to high-temperature fermentation or resistant to sodium fluoride and these results have been applied in production. The isolation of the virus of trachoma has been a success and a question in the etiology of trachoma which has consistently defied solution since the last part of the 19th century is now settled.

Discovery in Southern China

In recent years the new discovery in Southern China of certain relic plants including *Cathaya argyrophylla* of *Pinaceae* and the new records of certain tropical plant families and genera furnish important materials for the elucidation of the complicated Chinese Flora (111). The systematics of the genus *Pedicularis* of *Scrophulariaceae* has been extensively investigated and a new system for the arrangement of various taxa within the genus has been proposed. The phenomenon of the intercellular transmigration of the nucleus has been investigated rather intensively and good results have been obtained. Systematic studies have also been made in pollen morphology, wood anatomy and the early embryogeny of certain conifers.

Researches of great scientific value in the maturation of sex cells, fertilization, sex differentiation and ontogenesis of animals have been carried out. Certain results have also been obtained in the researches in skin, muscles, and nerve fibres and nerve cells.

In geology (6), (111-112), researches in the vortex structures and in the complex problems of the tectonic systems of China's Northwest have opened up a new avenue for the solution of the problems of tectonic movements of the earth crust.

In meteorology, systematic researches have in the past ten years been done on the theories of atmospheric circulation, particularly in regard to the principal factors affecting the atmospheric circulation in Southeastern Asia and the main weather processes in China. For instance, "Some Fundamental Problems of the General Circulation of the Atmosphere", published in 1958, embodies a systematic summary and review of the research results in this respect.

In palaeontology (111-112), valuable results have been obtained in the research in the flora of the Mesozoic Yenchang formation in Shensi Province, the research into the corals of the Siluvian and Ordovician periods, the trilobites and the fossils of the dinosaur from Laiyang in the Shantung Province. Palaeontologists through their researches of the human fossils and stone artifacts newly discovered at Tingtsun in Fenyang district in Shansi Province and at Mapa and Liukiang in South China have enriched palaeoanthropology (113).

In ten years' time the number of scientific research institutions and of scientific workers has grown in large proportions. At the end of 1958 there were already more than 840 research institutions for natural and technical sciences and more than 32,000 research workers, showing increases of 20 times and 50 times the Pre-Liberation figures respectively.

During the same period, organizations for scientific research have also been greatly strengthened. The total number of publications in the collections of the main library of Academia Sinica and the libraries of its various institutes has increased from 630,000 volumes at the time of Liberation to more than 6,000,000 volumes today. The main library has made arrangements for exchanging publications with 1,290 institutions in 56 countries. The Science Press, the publishing house of Academia Sinica, published from the beginning of 1950 to September, 1959, a total of 2,050 titles in books and about 2,700 issues in periodicals, containing in all 661,000,000 words and aggregating 30,800,000 copies. Besides, the Institute of Scientific and Technical Information has been established. At present this institute publishes 89 kinds of periodical publications on scientific and technical information and exchanges scientific documents in large quantities with most of the countries in the world.

The foregoing is a brief outline of the progresses made on China's science front during the last decade.

A Decade of Training

In the short period of ten years, China has already made great progress in developing her science. Along both fronts, scientific research work and the training of scientific workers, she has scored great victories. But what is more important is that we for the first time have gained the invaluable experience of promoting the development of science at high speed. Thus, it has become possible for us to launch scientific research in China into an era of big leap forward development. The creative talents of our people long buried under the old social system have now been stirred up into action by the great socialist revolution. The occurrence of such a great change in a country with a population of more than six hundred million is indeed an event of world significance. Each forward stride in the popularization and advancement of science taking place in this country will certainly have important effects upon the cause of peace and human progress.

Must Not Be Complacent

However, we should on no account indulge ourselves thereby in complacency, for when the level of natural sciences attained in China at present is compared either with the needs of the country and the people or with the level attained in the scientifically more advanced nations, we find that we are still a long distance behind. On the other hand we should not at all be discouraged thereby. For we have in our possession every favorable condition that enables us to do away with this distance in a very short time. The socialist system has already firmly established itself in our country; the dynamic developments in industrial and agricultural production are building up an environment extremely favourable to scientific research; our work in ideological education in the past ten years has resulted in a general heightening of the ideological consciousness among our scientific workers.

Scientific Ranks Expanding

The scientific ranks have been continually expanding; a buoyant revolutionary vitality and a creative spirit now pervade the whole scientific world in China. Furthermore, we have the invaluable assistance from the great Soviet Union, and from the fraternal socialist countries; and we receive help also from our friends all over the world who are concerned about the welfare of China, and about the cause of peace and human progress. The most important thing is that our cause is most enthusiastically supported by over six hundred million people and that leading us in our march forward is the Communist Party of China, the party that has been long tried and armed with Marxism-Leninism. Under the beacon light of the general line of our Party, our people will certainly bring our technical revolution to a complete victory and continuously score great successes in our march forward in the conquest of Nature. And China will undoubtedly emerge as one the great nations pre-eminant in science and culture.

Bibliographic Notes

pp. 388-392

Bibliographic Notes

As illustrated on the cover page, written Chinese, rather than being expressed by an alphabet, is expressed by characters or ideographs used individually or in various combinations corresponding to words. The ideal method for accurate documentation of a Chinese language article is to reproduce the characters appearing in the title, author's name, and journal title. As an aid to use, title translations for the article and journal may be provided in brackets after the Chinese characters, while the author's name may be transliterated in some standard system. In this way, confusion resulting from transliteration of the characters is avoided and correct identifications can be made. However, with the unavailability in the Washington area of type for Chinese characters, the following method has been used to identify the Chinese sources cited below:

Transliteration of title by the Wade-Giles system in quotes followed by the compiler's bracketed translation in quotes.

Transliteration of the author's name; those names appearing in the Communist Chinese article or table of contents in the *pin-yin* transliteration system are so given, followed by the Wade-Giles transliteration in brackets.

Transliteration of journal title in the same manner as explained above, with the compiler's bracketed translation; when titles appear bilingually, they are cited in order of the predominant language of publication and separated by a colon.

Sources of translated reference material:

Office of Technical Services, Annex 1, Dept. of Commerce, Washington 25, D. C.

Give OTS number and English title. When number not available, give full identification. JPRS translations to be requested from OTS.

Library of Congress, Photoduplication Service, Washington 25, D. C.

Facsimile prints or microfilms. Minimum charge per item $1, per order $1.50.

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庆祝祖国十周年

Photographs: p. 378, Fremont Davis; pp. 379, 381, 398, Chemical Engineering, Progress, American Institute of Chemical Engineers; pp. 383, 385, Eastfoto.

ASTRONAUTICS

Food in Space Flights

▶ THE WEIGHT of food man needs may limit the time he can spend in space, Miss Beatrice Finkelstein, space nutritionist for the Air Force and the National Aeronautics and Space Administration's Project Mercury, reported.

Storage and weight, rather than nutritional content, are the major limiting factors involved in space feeding, she said. Each pound of dry weight placed in an earth orbit requires ten pounds of propellant.

An adequate supply of ready-to-eat, prepackaged foods could be stored without a significant weight penalty for the several days required for a man to get to the moon and back. But food for a trip to Venus or Mars, almost a year away from earth, would impose too great a weight penalty, Miss Finkelstein said.

"If such packaged foods are to go with men on a planetary flight, the ship will have to carry about 1,300 pounds of food per man per year of flight. This is not economical with present launching requirements," the space food expert said.

The weight problem is only one of the many involved in feeding man in space with which Miss Finkelstein is concerned.

There is also the problem of feeding a man adequately and safely in a weightless environment. This requires special packaging so that food is accessible in easy-to-eat bite sizes to minimize the "danger" of crumbs. In a weightless environment, crumbs floating inside a space helmet and perhaps blocking the air tubes present a real danger, Miss Finkelstein said.

If she has her way, men in space will receive a diet as close to that normally enjoyed on earth as possible.

For her contributions to this vital area of space research, Miss Finkelstein has been selected as the recipient of the McLester Award in the field of nutrition and dietetics by the Association of Military Surgeons of the United States, at their annual meeting in Washington, D. C.

• Science News Letter, 78:393 December 10, 1960

ASTRONAUTICS

Man's Space Performance

▶ HOW EFFECTIVELY man performs in space may be told by a little black box no bigger than a bedside radio.

The box can be used to pick up and amplify the tiny electric signals from the brain's center of consciousness when animals or man are in space. This information could then be telemetered to earth.

The instrument, a transistorized brain wave machine, was developed by Dr. Ross Adey of the University of California, Los Angeles, Medical School. It was designed by Raymond Kadio, electronics engineer, under a project supported by the U. S. Air Force's Air Research and Development Command.

Weightlessness in space may basically alter the process of consciousness, Dr. Adey said. The brain is normally subject to an unceasing barrage of impulses arising in muscles, tendons and other deep body body regions. In the weightless state these impulses are reduced to a very low level. Thus man's level of awareness may be affected.

There may also be a problem of "space insomnia," Dr. Adey said. The porpoise which exists in a relatively weightless state in its watery world, does not display the sleep-wakefulness cycles common to land-living mammals. This sleepless behavior may be related to prolonged weightlessness.

Characteristic patterns of alertness and sleep are signaled by impulses from the brain's center of consciousness. Tiny electrodes planted in these centers in space animals would carry these signals to the black box and to earth via telemetry.

Dr. Adey believes this might give a more reliable measure of performance capability than having the animal press a lever. The animal may stop pressing a lever from boredom or just plain balkiness, he points out.

The system has been tested on animals in a human centrifuge and in vibration experiments simulating acceleration loads of rockets. It has passed with flying colors.

• Science News Letter, 78:393 December 10, 1960

TECHNOLOGY

Plastic Braille Books

▶ MORE BOOKS for the blind, cheaper to produce, easier to read, and less cumbersome than before, will become available in the near future. They will result from a new process of printing braille, invented by Edward Pyke, the technical officer of the Royal National Institute for the Blind.

Mr. Pyke's invention is the first real change in the method of printing braille since the process was started about 100 years ago. It consists of baking plastic dots on to paper instead of embossing them in the paper itself.

The new technique, strangely enough, is a reversion to Louis Braille's original method—round-headed nails, driven into a plank, by which he was taught to "feel" the letters of the alphabet.

The braille alphabet consists of permutations of six dots within the shape of a domino six. The dots, until now, have been embossed on special Manila paper by distorting the fibers, a not-altogether satisfactory method since the dots wear down with the friction of moving fingers. The new method briefly consists of baking solid plastic dots on to the surface of a thin strong paper.

Several leading British industrial companies combined to help make the new invention possible. Imperial Chemical Industries found the right plastic paste for the work, Spicers found the paper that could go through the General Electric Company's infrared curing ovens without taking fire, and Mono Pumps designed the pumps that lift the plastic.

• Science News Letter, 78:393 December 10, 1960

TECHNOLOGY

Turn Stove On and Off By Dial Telephone

▶ A HOUSEWIFE can turn her stove on or off by dial telephone with an experimental control system developed by engineers of the Westinghouse Electric Corporation, Pittsburgh, Pa. The phone system is part of an exhibit of future products for the home. If made available commercially, the system would permit a housewife to dial her home, dial the appliance she wants to control and then dial one more digit to turn the appliance on or off.

• Science News Letter, 78:393 December 10, 1960

PHYSICS

Improvements Planned For Berkeley Bevatron

▶ AN EXTENSIVE program of improvements to the 6.2 billion-electron-volt bevatron are planned by the University of California's Lawrence Radiation Laboratory.

The scheduled modifications will permit a greater number and wider range of high-energy experiments with the giant proton accelerator. They will improve the machine's efficiency and usefulness in nuclear research.

The improvements, expected to begin shortly and to be essentially complete by the spring of 1964, will cost about $9.6 million. Funds are being provided by the U. S. Atomic Energy Commission.

The bevatron has pioneered a new phase of nuclear research, making possible the discovery of the antiproton, the antineutron and other particles.

The changes will not increase the energy of the proton accelerator, but more protons will be accelerated. Ten bursts of protons are now fired each minute by the pulsed machine, with about 100 billion protons in each burst. After the modifications, it is hoped that some 10,000 billion protons will emerge in each burst.

The new program calls for a completely new injection system, consisting of a new ion gun and a new linear accelerator.

• Science News Letter, 78:393 December 10, 1960

PUBLIC HEALTH

Aging With a Future

The first White House Conference on Aging will be held Jan. 9-12, 1961. It was called by President Eisenhower, oldest president to leave office, Faye Marley reports.

➤ EVERYBODY TALKS about the aging today, and some 3,000 people soon will be converging on the nation's capital to do something about it.

The first White House Conference on Aging will be held in Washington, D. C., Jan. 9-12, 1961, scarcely more than a week before the youngest President of the United States ever to be elected is inaugurated on Jan. 20. The call for the meeting was made by President Eisenhower, oldest to relinquish the office.

The Conference is definitely nonpolitical. Rep. John E. Fogarty (D.-R. I.) introduced the bill that became law in 1958 authorizing the President to call a meeting "to develop recommendations for further research and action in the field of aging."

Rep. Fogarty said that there had been a great deal of talk about aging and "what we need now is action." He said with some 50 million Americans middle-aged or older —16 million are 65 and over—"we should be moving to help older men and women fulfill their hopes and aspirations."

The technique of this Conference will follow that of previous conferences for children and youth, bringing to the attention of the public the need for a national program for older people.

Five basic areas will be discussed: employment, income, housing, free time and health, broken down into 20 related topics.

Want Practical Recommendations

Meeting in Washington in mid-November to complete plans were about 200 key citizens, including 150 National Advisory Committee members appointed by Secretary Arthur S. Flemming of the Department of Health, Education, and Welfare, which is sponsoring the Conference. Fifty-three were appointed by governors of the United States states and territories.

Uppermost in the minds of these citizens —many of them experts in gerontology, the scientific study of the various phenomena of old age—was that some practical recommendations should come out of the 20-section planning "structure."

Dr. Ewald W. Busse, chairman of the department of psychiatry, Duke University School of Medicine, Durham, N. C., who heads up the medical part of the White House Conference group on research in gerontology, stressed the health needs of the aging.

"It would be foolish to prolong life," he said, "if it were only to expand the number of facilities for the chronically ill."

He said the first major goal for the aging is to eliminate or reduce those illnesses that detract from the individual ability to have a healthy and happy life. He emphasized preventive medicine and rehabilitation rather than measures to stop disease processes after they have begun.

He mentioned nutrition, exercise, environmental "alterations," and pointed out that health can no longer be considered without including social and psychological influences. He said the interaction of socio-economic forces upon the health of aging persons should be "more precisely identified."

Dr. Busse said he hoped recommendations would be made for funds for research in universities and institutions responsible for a solution to problems of the aging.

Dr. Wilma Donahue, chairman of the division of gerontology, University of Michigan, Ann Arbor, chairman of the White House Conference group on the role and training of professional personnel, said that the great problem in America today is the need for trained persons to carry out programs for the aging.

Dr. Donahue said the Golden Age centers, housing projects, meals on wheels and other modern projects created for the aging population have brought a need for persons who understand the specific problems of the growing numbers of older people.

She told of long-term research studies in her own field of gerontology and said more work of this kind was needed all over the United States. She said several physicians at the University of Michigan Medical School, specialists in internal medicine and physical rehabilitation, are cooperating to give special attention to the illnesses and disabilities of aged persons.

Illustrating what can be done to improve the condition of institutionalized aged persons, she told of an extended three-year study of the aged in three Michigan county hospitals.

Sheltered Workshops Set Up

One of the projects helped by communities was the setting up of sheltered workshops within the hospitals, supported by contracts from local industries. In the craft-training program, she said her staff demonstrated that old people can learn new things.

"The average age of those old people was 75," she said. "One patient still in his sixties learned to make beautiful tile tables within a month. Another patient learned rug-making so well that he got ongoing contracts with local stores."

Improvement in these three hospitals re-

CREATIVE WORK—A hand loom provides occupational therapy to correct physical handicaps and supply creative accomplishment. This patient and her instructor are working together at the District of Columbia Village.

sulted in 75% of the patients being discharged, either for life at home or in other places besides hospital settings. Health improvement was noted in 90%.

Asked what she hoped would come out of the White House Conference on Aging, Dr. Donohue said, "First, I hope that the Conference will direct a request to the universities of the country that they establish, either on a state or a regional basis, institutes of gerontology whose function will be to carry on research, offer training and give service.

"Second, I hope the Conference will strongly recommend to Congress that funds be appropriated to provide special training grants for the use of persons who wish to be trained for service in this field.

"Funds are earmarked for children's work, for medical social work, for criminology, for psychiatric work—all important—but both Congress and private foundations should give funds for aid to universities and direct loans to students for training in gerontology in all its aspects."

The basic Conference "structure" includes 2,800 official delegates, with 1,747 representing all 50 states, the District of Columbia, Puerto Rico and the Virgin Islands.

States have held preliminary meetings and prepared reports as a basis for discussion.

There will be 600 delegates representing approximately 300 national voluntary organizations that have met requirements of the National Advisory Committee. Older people who are not "experts" except on their own needs are included.

In addition, there will be 393 other delegates, consisting of the 150 advisory committee members, consultants to the 20 planning committees and others designated by Secretary Flemming. No Federal employees will have delegate status.

Swelling the number in attendance at the Conference will be guests from foreign countries and from Federal departments and agencies. All members of Congress and state governors are included in this invitation.

Recommendations for action by communities, states, the Federal Government, private organizations and older people themselves will come from the ten groups covering the following subjects:

Population trends and social and economic implications, income maintenance, impact of inflation on retired persons, employment security and retirement; health and medical care and rehabilitation; social services, family life, family relationships and friends; housing; education; role and training of professional personnel; free time activities; recreation, voluntary services, citizenship; religion; research in gerontology; biological, medical, psychological and social sciences; local community organization, state organization, national voluntary services and service organizations, Federal organizations and programs.

Group reports will be given at plenary sessions held in Constitution Hall. The Conference theme is "Aging With a Future—Every Citizen's Concern."

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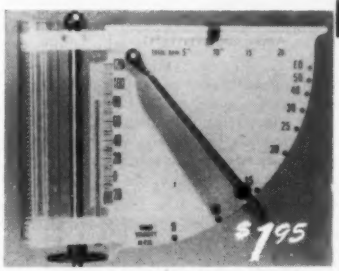

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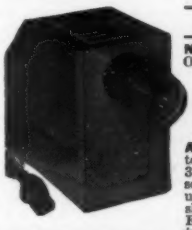

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BECOMING MORE CIVILIZED: A Psychological Exploration—Leonard W. Doob—*Yale Univ. Press*, 333 p., $6. Scholarly inquiry into how the beliefs, values, personalities and behavior of people in nonliterate societies are affected by contact with Western civilization.

THE BIOLOGY OF AGING: Symposium—Bernard L. Strehler, Ed.—*AIBS*, 364 p., illus., $7.75. Revised papers and discussions of 1957 Conference investigating the basic mechanisms underlying the gross phenomenon of aging.

CALL OF THE ARCTIC—Robert Steelman—*Coward-McCann*, 316 p., $5. Fictionalized story of the American amateur explorer who led three expeditions to the Arctic between 1860 and 1871.

THE CHILD WITH MONGOLISM (Congenital Acromicria)—Clemens E. Benda—*Grune & Stratton*, 276 p., 85 illus., $9.50. Based on 25 years of research, brings together what is known about the diagnosis, anatomy and nervous system, hematology and etiology of mongoloid children.

CLASSICS IN BIOLOGY: A Course of Selected Reading by Authorities—Walter Robert Matthews and others, introd. reading guide by Sir S. Zuckerman—*Philosophical Lib.*, 351 p., $6. Writings on the unity and the diversity of life, and on biology and health.

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COMPARATIVE EFFECTS OF RADIATION—Milton Burton, J. S. Kirby-Smith and John L. Magee, Eds.—*Wiley*, 426 p., illus., $8.50. Latest findings by radiation biologists, chemists and physicists, presented at NAS-NRC conference held in Puerto Rico, February 1960.

DENTISTRY IN THE UNITED STATES: Status, Needs and Recommendations—Commission on the Survey of Dentistry in the U. S.; Byron S. Hollinshead, Dir.—*Am. Council on Educ.*, 68 p., paper, $1. Results of extensive survey of U. S. dental health, practice, education and research.

THE EDUCATOR . . . AND THE ATOM: A Report on the Symposium on Nuclear Education—Sanborn C. Brown, Chmn.—*Baird-Atomic, Inc.*, 46 p., illus., paper, single copies free upon request direct to publisher, 33 University Road, Cambridge 38, Mass. Discusses the role of radioisotopes, their use in schools, federal programs and laboratory experiments.

THE FOUNDATIONS OF ARITHMETIC: A Logico-Mathematical Inquiry into the Concept of Number—Gottlieb Frege, transl. from German by J. L. Austin—*Harper*, 2nd rev. ed., 119 p., paper, $1.25.

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AN INTRODUCTION TO SOCIAL PSYCHOLOGY—William McDougall—*Barnes & Noble*, 524 p., paper, $1.95. Reprint of 23rd edition of pioneer book, first published in 1908.

AN INTRODUCTORY TREATISE ON THE LUNAR THEORY—Ernest W. Brown—*Dover*, 292 p., paper, $2. Unabridged reprint of 1896 edition.

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(Continued on p. 398)

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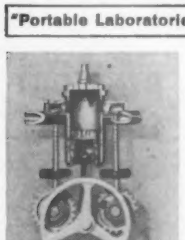

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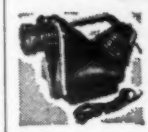

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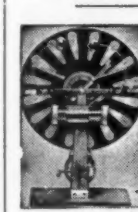

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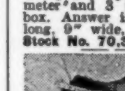

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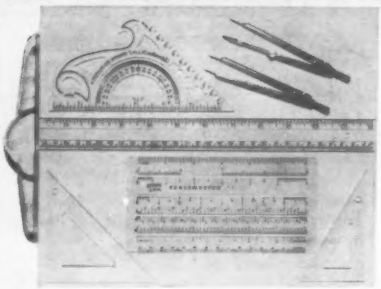

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Books of the Week

(Continued from p. 396)

Harold E. Jones and others; Ira Iscoe and Harold W. Stevenson, Eds.—*Univ. of Texas Press*, 171 p., $4. Papers presenting current research in child development.

THE PRINCIPLES OF SCIENTIFIC RESEARCH—Paul Freedman, introd. by C. H. Waddington—*Pergamon*, 2nd ed., 228 p., $4.50. Addressed to the young scientist, discusses what scientific research is like as a way of spending one's life.

PRINCIPLES OF STELLAR DYNAMICS—S. Chandrasekhar—*Dover*, enlarged ed., 313 p., illus., paper, $2. Unabridged reprint of 1942 edition, with three papers published in 1943.

PSYCHOLOGICAL TECHNIQUES IN DIAGNOSIS AND EVALUATION—Theodore C. Kahn and Martin B. Giffen—*Pergamon*, 164 p., illus., $6.50. Discusses the clinical use of psychological tests and their limitations.

PURE MATHEMATICS, Vol. I: Calculus. Vol. II: Algebra, Trigonometry, Coordinate Geometry—F. Gerrish—*Cambridge Univ. Press*, 438 p., 483 p., $5, $6.50. A university course.

RADIOISOTOPE EXPERIMENTS FOR THE CHEMISTRY CURRICULUM—Nuclear-Chicago, Norman Radin, Ed.—*AEC (OTS)*, unpaged, illus., paper, $2. Describes 33 experiments designed to introduce students to radioisotope techniques and their potential usefulness.

RADIOISOTOPE LABORATORY TECHNIQUES—R. A. Faires and B. H. Parks, foreword by Henry Seligman—*Pitman*, 2nd ed., 244 p., illus., $5.75. Tells the scientist and technologist how to use radioisotopes safely and effectively in research laboratories, medicine and industry.

THE WASTE-MAKERS — Vance Packard—*McKay*, 340 p., $4.50. Considers the effects on people and products of a primarily sales-oriented economy.

• Science News Letter, 78:396 December 10, 1960

Questions

AGRICULTURE—What plant disease is the new antibiotic agent, P-9, expected to control effectively? p. 375.

MEDICINE—What is the principal form of fat in the diet? p. 371.

METEOROLOGY—What is the speed of Tiros II? p. 373.

Photographs: Cover, Radio Corporation of America; p. 371, U. S. Army, Office of Technical Liaison; p. 373, Electronic Associates, Inc.; p. 375, Mildred J. Ericson; p. 394, U. S. Dept. of Health, Education and Welfare; p. 400, R. H. Fisher Co. (Photo credits for the Supplement pp. 377-392 on p. 392.)

Do You Know

Experiments of early balloonists led directly to heavier-than-air *flight* and were essential preliminaries to the space-flight experiments of today.

The Office of Civil and Defense Mobilization has ready for transportation and assembly throughout the country almost 2,000 Civil Defense Emergency *Hospitals*.

Unremembered *dreaming* is so much a part of normal human experience that dream suppression, if carried on long enough, could result in a serious disruption of personality.

• Science News Letter, 78:398 December 10, 1960

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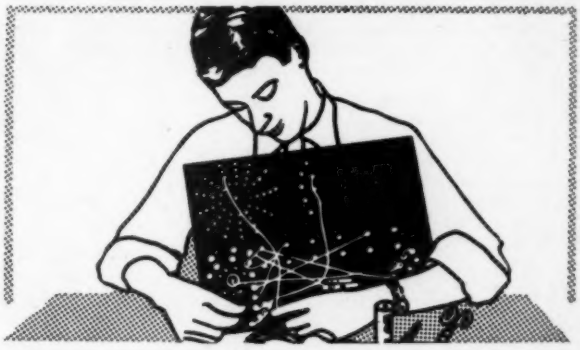

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- Manual "Brainiacs—Small Electric Brain Machines—Introduction and Explanation" by Edmund C. Berkeley, 1959.
- "Introduction to Boolean Algebra for Circuits and Switching" by Edmund C. Berkeley.
- "How to Go from Brainiacs to Automatic Computers" by Edmund C. Berkeley.
- List of references to computer literature including "Minds and Machines" by W. Sluckin, published by Penguin Books (Baltimore), 1954, 233 pages, and other references.

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MOBILE CHARCOAL GRILL can be rolled out of niche in countertop or any corner area of the kitchen and moved to patio for outside cooking. A built-in rack holds a variety of seasonings and there is storage space for charcoal lighter and other items in a compartment above the wheels.

• Science News Letter, 78:400 December 10, 1960

FISH BAIT AERATOR keeps minnows, crayfish, shrimp alive until ready for use. Complete plastic encased 6-volt, DC electric pump, operating on flashlight batteries, continuously forces millions of fresh air bubbles into a minnow bucket for at least 24 hours. It will run indefinitely when plugged into cigarette lighter socket of car.

• Science News Letter, 78:400 December 10, 1960

KITCHEN STORAGE CABINET has a door that slides up out of the way. The shelves can be raised and lowered like the old-time dumb-waiter, but automatically at the touch of a button.

• Science News Letter, 78:400 December 10, 1960

ROUND LOOM that can be held in the hand helps create scatter rugs, coaster sets, chair seats and clothing decorations. Strips

of remnant materials are wound up and then put through slots in the loom, shown in the picture. The circular pieces produced may be sewn together into larger items.

• Science News Letter, 78:400 December 10, 1960

AUTOMATIC TWEEZER eliminates both pain and pull from eyebrow plucking. It works on the principle that a hair can be removed painlessly if done very quickly. The stainless steel instrument uses a high-speed piston-in-cylinder principle, making action so rapid that pain is virtually eliminated.

• Science News Letter, 78:400 December 10, 1960

CHEESE OR BUTTER SLICER makes perfect pats in a jiffy. Insert bar of cheese, butter or margarine in cutter and slice only what is needed. The device is of break-resistant, easy-to-wash plastic.

• Science News Letter, 78:400 December 10, 1960

GOLDEN LUSTER INITIALS stick permanently to all materials, do not fade or tarnish, and can be washed, waxed or cleaned. Easy to use for personalizing gifts or making your own monograms. The kit has 200 assorted A to Z initials.

• Science News Letter, 78:400 December 10, 1960

RUBBERIZED EXTERIOR HOUSE PAINT for all surfaces may be applied over surface dampened by rain or dew. It dries bug-free and dust-free in 30 minutes. A second coat may be applied the same day. The paint is said to resist the formation of blisters and is available in 12 ready-mixed colors.

• Science News Letter, 78:400 December 10, 1960

Nature Ramblings

HUNTERS must develop either stealth or speed in order to capture their prey. The leopard waits in ambush, while the cheetah outruns even the fleetest antelope to make its kill.

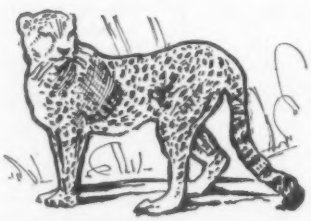
These two great cats, so much alike in many respects, differ in ways that adapt them to their separate ways of life. The leopard is supremely camouflaged. His body is heavy and strongly muscled for a a quick leap and a sudden kill.

The cheetah is more lightly built, with very long legs and a degree of "streamlining" not seen in the leopard: adaptations for great speed.

Throughout the animal kingdom, shape and structure of living things are seen to be related to different ways of life. Hunter sharks are lithe and streamlined to a fine degree; their cousins, the sawfishes, are flattened from top to bottom, an adaptation to life on the bottom in wait of prey.

The hunted as well as the hunters show particular relationships between body form and function. Members of the deer family are frequently called "spring-footed" animals, because their bodies are so constructed

Built to Order



that they can make great bounding leaps at escape pace.

Pocket gophers live all their days beneath the soil; their eyes are dim and their forefeet modified into great, sharp shovels. Their relatives who are not so permanently bound to their burrows, for example the ground squirrels, have keen sight and their limbs are unmodified so that they may scamper quickly into their dens at the approach of danger.

Adaptations of related animals to terrestrial or aquatic conditions are often seen.

For example, the strictly aquatic turtles of the oceans have their legs modified into swimming flippers and have no obvious trace of toes.

Strictly land turtles, such as the gopher turtle of the American south and west and the giant Galapagos turtle, have well-developed toes with little or no webbing and very heavy, "elephant-like" limbs to support their weight on land.

Man, an upright-walking animal, has strong legs but relatively weak arms.

Tree-dwelling monkeys have long, strong arms, and some use their prehensile tails to make sure there are no slip ups.

Birds, on the other hand, are particularly equipped for flight, not only because their "arms" are wings, but also because their weight is highly centralized in the middle of the body.

In addition, a bird gets double use of its air by an arrangement of supplementary air sacs connected to the lungs.

Whether an animal lives in water, on land or takes to the air, and whether it eats meat, plants, or both, it does so because of its construction.

—HORACE LOFTIN

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